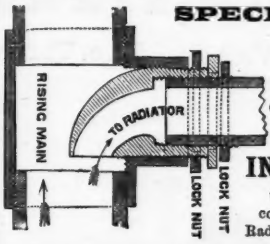
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXX. No. 1807.] LONDON, DECEMBER 28, 1897. [49TH YEAR. PRICE 6d.

TUBES AND FITTINGS
FOR
GAS, STEAM WATER,
AND ALL PURPOSES,
ALSO
COILS OF EVERY SIZE AND SHAPE.

Apply to the Original Firm of
JOHN BROTHERTON
LIMITED,
Imperial Tube Works, Monmore Green,
WOLVERHAMPTON.
ESTABLISHED 1861.

GAS CONSUMERS' REQUIREMENTS.
TUBES, COCKS, UNIONS, BRACKETS, PENDANTS, LANTERNS, CHANDELIERS, AND GENERAL FITTINGS.
MANUFACTURED BY
VAUGHAN & BROWN, LTD.,
15, 16, 17, Kirby Street, London, E.C.



SPECIALITE
FOR
HOT-WATER CIRCULATION.
'ACME' PATENT INJECTOR,
to be fixed in connection with Radiators on Mains.

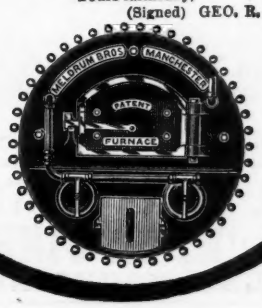
— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores, for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

'BEAR CREEK' CANNEL
LOG MOUNTAIN COAL, COKE, AND TIMBER CO.
PINEVILLE, KENTUCKY, U.S.A.
Cable Address:
"HULL, PINEVILLE." Codes used "ABC" & "A1."
Communications to the Company only.

CARLESS, CAPEL & LEONARD,
HOPE CHEMICAL WORKS, HACKNEY WICK, LONDON, N.E.,
And at Pharos Works, Hackney Wick.
NAPHTHA AND GASOLINE DISTILLERS AND PETROLEUM IMPORTERS,
Specially distil Carburine Spirit, specific gravity ·680, or of any other grade suitable for Enriching Gas; also Gas Oil best adapted for injecting into the Retorts, as in the Herring Process.
Importers of Petroleum for Carburetting Water Gas, or for Manufacturing Oil Gas. Distillers of Pentane, Petroleum Ether, and Naphtha for clearing the pipes of Naphthaline, &c.
Samples and Prices may be had on application.

"MELDRUM" FURNACE
INVALUABLE FOR
GAS-WORKS
FOR BURNING
COKE BREEZE,
PAN BREEZE,
SWEEPINGS,
COAL DUST,
&c., &c.

The Engineer's Office, Gas-Works, Blackstonn Road, Paisley.
GEORGE R. HISLOP, C.E., F.C.S.,
Engineer and Manager.
Messrs. MELDRUM BROS., *June* 23, 1896.
101, St. Vincent Street, Glasgow.
DEAR SIRS,—In reply to your favour of even date, I have much pleasure in stating that the two Boilers fitted with the "Meldrum Furnaces" by your Firm last year are affording me the highest satisfaction; and, while confidently recommending their application to Steam-Boilers generally, their advantages in Gas-Works are such that none should be without them.
Yours faithfully,
(Signed) GEO. R. HISLOP.



ALSO USED IN CONJUNCTION WITH
TAR BURNING
ARRANGEMENT
WITH GREAT SUCCESS.
Write for Catalogue and other Testimonials.
RESULTS GUARANTEED.
Meldrum Bros.,
ATLANTIC WORKS, MANCHESTER,
ALSO AT
LONDON, LEEDS, LIVERPOOL,
BIRMINGHAM, NEWCASTLE, & GLASGOW.
BRANCH HOUSES AT
PARIS, NEW YORK, BOMBAY, TOKIO, and SYDNEY.

5400
WORKING.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

EDWARD COCKEY & SONS, Ld.

MANUFACTURERS OF **PURIFIERS** OF ALL SIZES,

With Improved Centre-Valves, to work either One, Two, Three, or Four Purifiers at one time.

SLIDE VALVES.

SCREW VALVES.

SEAL-REGULATING VALVES.

GASHOLDER VALVES.

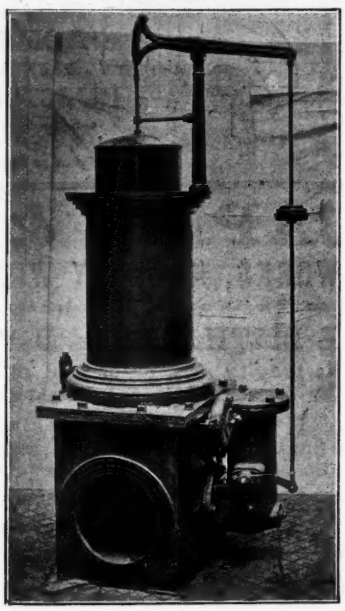
FOUR-WAY VALVES.

DISC VALVES.

SELF-ACTING BYE-PASS VALVES.

COMPENSATING VALVES.

IMPROVED COMBINED SELF-ACTING BYE-PASS & COMPENSATOR for EXHAUSTERS



Hand-Power LIFTS, suitable for weights up to 10 Tons.

Hydraulic Power GOLIATHS, suitable for any Weights.

Improved WOOD GRIDS for Purifiers and Scrubbers.

Specially Designed for use where Space is limited.

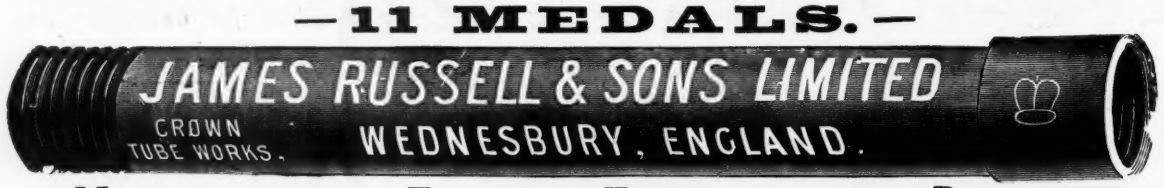
SPECIFICATIONS AND PRICES ON APPLICATION TO—

THE IRON-WORKS, FROME, SOMERSET.

Telegrams: "COCKEYS, FROME." London Agents: Messrs. BALE & HARDY, Bridge House, 181, Queen Victoria St., E.C. Telegrams: "DAMPER, LONDON."

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—



MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

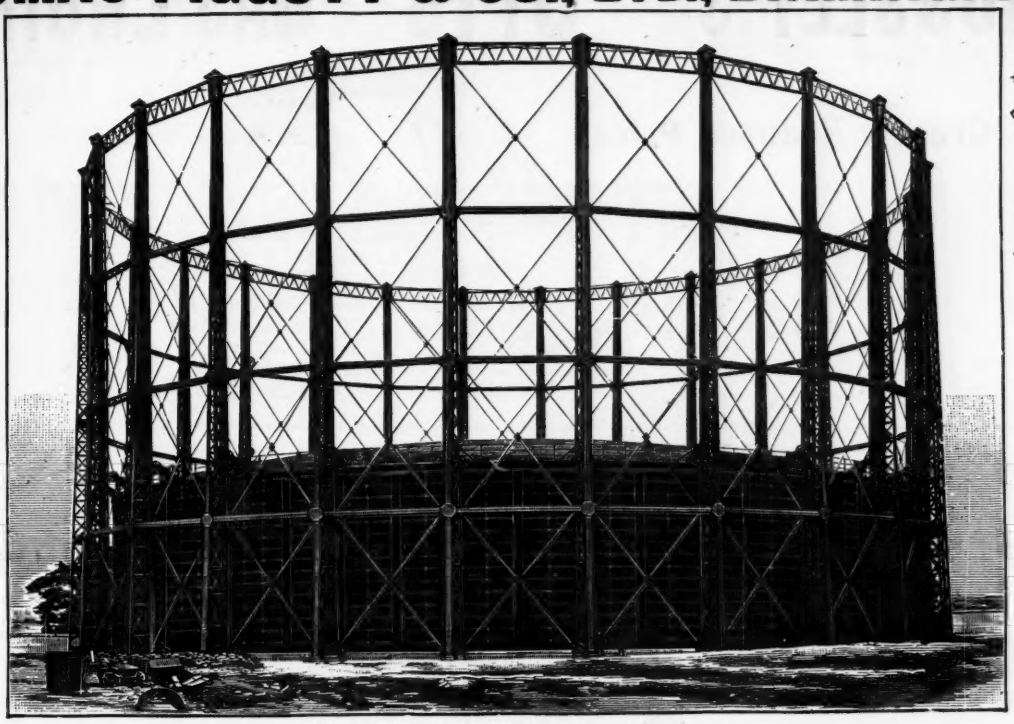
SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street. MANCHESTER: 33, King Street West. BIRMINGHAM: 114, Colmore Row. LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS BIRMINGHAM

WELDED & RIVETED PIPES FOUL MAINS. RETORT LIDS, WROT & CAST TANKS, PURIFIERS.

MANUFACTURERS OF

HUMPHREYS & GLASGOW'S

PATENT CARBURETTED WATER-GAS PLANT.

INSTALLATIONS HAVE ALREADY BEEN SUPPLIED, AND ARE IN HAND FOR THE FOLLOWING GAS-WORKS: COPENHAGEN, BELFAST, GLASGOW, BRUSSELS, SANTIAGO, SWANSEA, TOTTENHAM, LIVERPOOL, BRIGHTON, BATH, PRESTON, SOUTHPORT, NEW YORK, NEWBURGH (N.Y.), NEWBURGH (SECOND CONTRACT), HOYLAKE, BELFAST (SECOND CONTRACT), EDINBURGH, TOTTENHAM (SECOND CONTRACT), WINCHESTER, MANCHESTER, BRUSSELS (SECOND CONTRACT), ST. JOSEPH (MO.), HOLYOKE (MASS.), SHANGHAI, STOCKTON, STOCKPORT, NORWICH, GUILDFORD, SYRACUSE, BORDENTOWN, LEA BRIDGE, COVENTRY, COMMERCIAL, BRENTFORD, BRIDLINGTON, MIDDLESBROUGH, CROYDON, L. & N.W. RY. CREWE, NINE ELMS, BROMLEY, COVENTRY (SECOND CONTRACT), TAUNTON, ROTTERDAM, DORKING, LEA BRIDGE (SECOND CONTRACT).

JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

Telegrams: "EVANS WOLVERHAMPTON." PLEASE APPLY FOR CATALOGUE No. 8. National Telephone No. 7039.

12,000 PUMPS IN STOCK AND PROGRESS.

TRADE MARK.

NO TAPPETS.

Fig. 703. "SINGLE RAM" STEAM-PUMP.

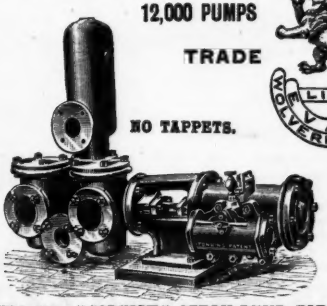


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

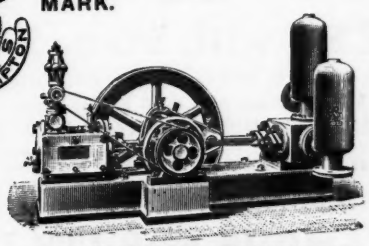


Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

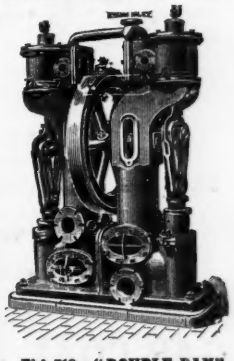
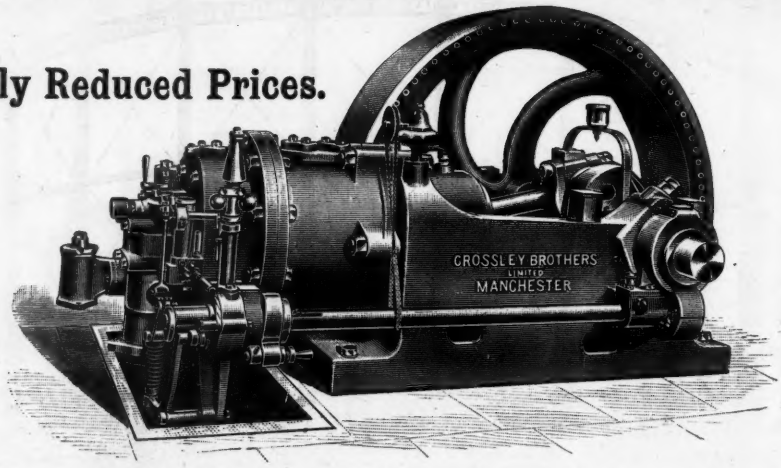


Fig. 712 "DOUBLE-RAM" STEAM-PUMP.

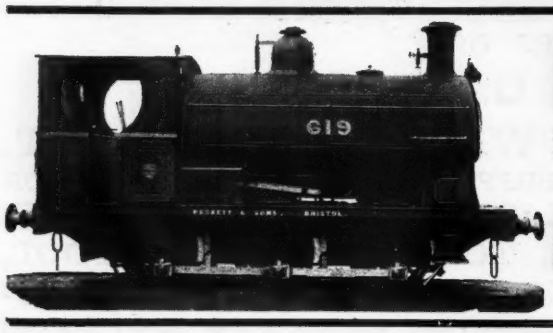
CROSSLEY'S "OTTO" GAS-ENGINES

Greatly Reduced Prices.



REPRESENTS NEW TYPE 40-HORSE POWER NOMINAL HIGH-SPEED ELECTRIC-LIGHT ENGINE.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.



LOCOMOTIVES

LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for Immediate Delivery.

Photographs, Specifications, and Prices on Application.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

Telegraphic Address: "PECKETT, BRISTOL."

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, WITH RACK & PINION OR Internal or External SCREWS of all sizes.

GASHOLDERS, AND Gasholder Tanks.

CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

of every description,

Iron Roofs, Columns, Girders, Floor Plates, Tools, &c.

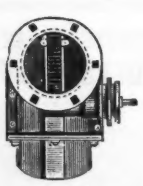
WROUGHT AND CAST IRON CONDENSERS, SCRUBBERS, & WASHERS,

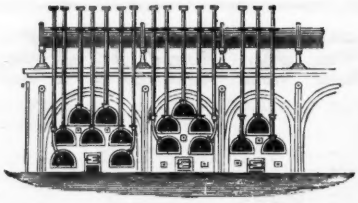
TAR AND LIQUOR PUMPS, &c.

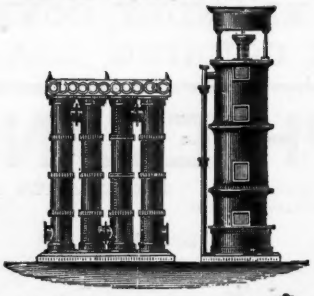
PATENT CENTRE-VALVES

for working Purifiers,

Also Bye-Pass & Stop Valves





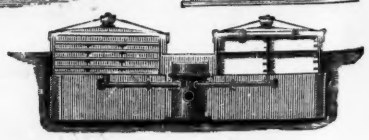


PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS, and SPECIALS.

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

INCANDESCENT GAS-LIGHT

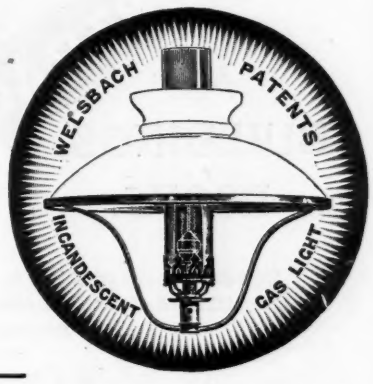
(WELSBACH PATENTS).

THE GREATLY REDUCED CONSUMPTION OF GAS COVERS THE INITIAL COST OF THE BURNER IN LESS THAN SIX MONTHS.

The Ordinary "C" Burner,
PRICE 6/6.

The "C" Bye-Pass Burner,
PRICE 7/6.

Prices of other Patterns Reduced Proportionately.



The attention of **Gas Managers and Gas Engineers** is called to this System of Lighting as one which tends to **Popularize the Use of Gas** as an Illuminant, owing to the following Advantages :—

Economy in Consumption of Gas, combined with High Illuminating Efficiency.
Freedom from Smoke, Dirt, and Flickering.
Greatly Reduced Heat.
The combination of High Lighting Power with DURABILITY can only be obtained by The Welsbach System.

The **"Lancet" Special Analytical and Sanitary Commission,** in an exhaustive report, pronounces the "Incandescent Gas-Light System" to be the **Healthiest, Best, and most Economical System of Gas Lighting.**

Suitable for every purpose of **Inside and Outside Lighting.**

Avoid the WORTHLESS IMITATIONS now being offered by UNSCRUPULOUS INFRINGERS.

OVER ONE HUNDRED AND FIFTY JUDGMENTS

and Interim Injunctions recently obtained against Companies, Firms, and Persons INFRINGING THE "WELSBACH" PATENTS, or INFRINGING THE LIMITED LICENSE under which the Mantles are sold.

FOR FURTHER PARTICULARS, APPLY TO

THE INCANDESCENT GAS-LIGHT COMPANY, Ltd.,
PALMER STREET, WESTMINSTER, LONDON, S.W.

TELEGRAMS: "FIRECLAY," LEEDS. TELEPHONE No. 612.

COAL and COKE Breakers, Elevators, AND Conveyors.

RETORTS, Bricks, Blocks, Tiles, &c.

ENGINEERS IRONFOUNDERS CONTRACTORS MANUFACTURERS

EVERY DESCRIPTION OF

RETORT SETTINGS AND IRONWORK.

WE GUARANTEE RESULTS.

BUILDINGS, ROOFS.

RE-SETTING RETORTS.

We desire to call attention to our SHALLOW REGENERATIVE SETTINGS, which are comparatively inexpensive to erect, and productive of excellent results. They are specially designed to suit those Retort Houses where for various reasons it is undesirable to excavate to any great depth.

We shall be pleased to furnish Designs and Estimates on application.

THE LEEDS FIRECLAY CO. LTD., ENGINEERING DEPARTMENT, WORTLEY, nr. LEEDS.

THE "TRAFALGAR"

PREPAYMENT GAS-METER

FOR PENCE, SHILLINGS, OR ANY COINAGE.

THE ADVANTAGES OF THIS SYSTEM ARE:

1. Simplicity of Mechanism.
2. Absolute Accuracy.
3. Impossibility of being tampered with.
4. Unaffected by irregularities in shape or thickness of the penny.
5. Can be fixed to any ordinary Wet or Dry Meter.
6. Extra large Money-Box.
7. Price Changer can be altered without otherwise disturbing the Meter.
8. Index showing number of Pennies in the mechanism at any time.
9. Rejection of Half-Pennies certain.

GUARANTEED FOR FIVE YEARS.

FRANK WRIGHT'S PREPAYMENT GAS-METER CORPORATION, Limited,

Telegraphic Address: "Gasometer, London."

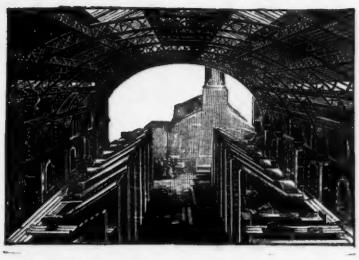
Manufacturers of Wet and Dry Gas-Meters.

Offices and Works: 62, GLENGALL ROAD, S.E.

Telephone No. 59 Peckham.

W. C. HOLMES & CO.

IRONFOUNDERS AND CONTRACTORS.

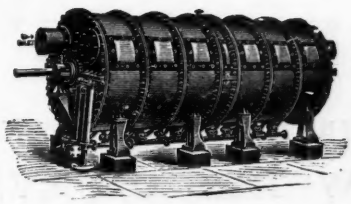


Makers of
GAS & CHEMICAL
PLANT.

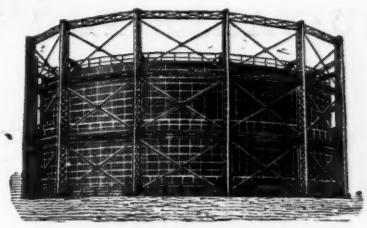
Telegrams:
"HOLMES, HUDDERSFIELD."

Improved
PATENT SCRUBBER-WASHERS,
All sizes,
From 50,000 to 5,000,000 Cubic Feet of Gas per day.
Results unrivalled. Send for Particulars and Prices.

MALLEABLE
and all Kinds of
CASTINGS.



GASHOLDERS of Improved Construction and of all Sizes.
ROOFS, BRIDGES, TANKS, GIRDERS.



Improved
BYE-PASS and
CENTRE-VALVES,
GOVERNORS,
and METERS.

Rotary or Pump
EXHAUSTERS.

80, CANNON STREET, LONDON,
AND
WHITESTONE IRON WORKS, HUDDERSFIELD.

THE
MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

Over 50 Maxim Patent Carburettors have now been fixed, capable of enriching

650,000,000

CUBIC FEET OF GAS PER DAY.

Among the Companies supplied are The Gaslight and Coke Company, the South Metropolitan Gas Company, Birmingham Corporation, Manchester Corporation, Rochdale Corporation, Bristol Gas Company, and many other Works, both large and small, where they have been working in some instances for the past **FOUR YEARS.**

More Gas and saleable Coke per ton of Coal Carbonized is produced; saving Capital, Labour, Fuel, Wear and Tear, &c.

The Enrichment is **INSTANTANEOUS** and **PERMANENT.**

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

SOLE AGENTS FOR REDWOOD & CLOWES' INFLAMMABLE VAPOUR & GAS DETECTORS.

Dealers in Carburine and all other Naphthas for the Enrichment of Gas.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,
18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

GIBBONS BROTHERS, LIMITED,

Telegraphic Address: "GIBBONS, DUDLEY."

DUDLEY,

Telephone No. 8013.

GAS ENGINEERS, CONTRACTORS, RETORT SETTERS.

Patent REGENERATIVE SETTINGS,

GIBBONS & MASTERS' PATENT No. 1269, 1893.

SUITABLE FOR WORKS OF EVERY CAPACITY,

AND A SPECIAL FORM OF WHICH IS APPLICABLE TO

GASEOUS FIRING WITH A MINIMUM EXCAVATION.

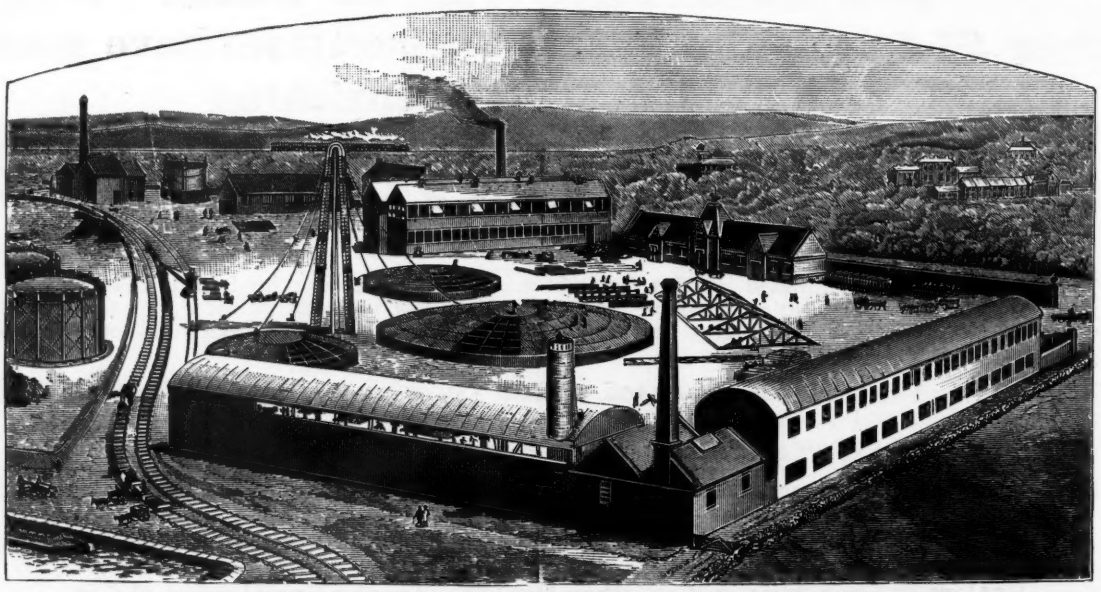
RETORT-BENCH IRONWORK, CONDENSERS,

SCRUBBERS, PURIFIERS, VALVES, &c.

DESIGNS AND ESTIMATES ON APPLICATION.

WILLEY & CO., GAS ENGINEERS.

OFFICES: EXETER. WORKS: 248, Kingsland Road, LONDON; James St., and St. Thomas, EXETER.



MANUFACTURERS OF WATER-GAS PLANT, GASHOLDERS, GAS-FITTINGS, GAS APPARATUS.

WET AND DRY CONSUMERS' METERS, AUTOMATIC METERS—PENNY-IN-THE-SLOT.

CONTRACTORS TO THE GOVERNMENT.

Telephone 132. Telegraphic Address: "WILLEY, EXETER."

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 84, OLD BROAD ST., E.C.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day. Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

EVESON FOR CANNEL

TELEGRAMS:

"EVESON, BIRMINGHAM."

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

Lanemark Coal Co.,

LIMITED.

LANEMARK CANNEL AND GAS COALS.

Quotations and Analysis on Application to

LANEMARK COLLIERY,

NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

HARRIS & PEARSON,

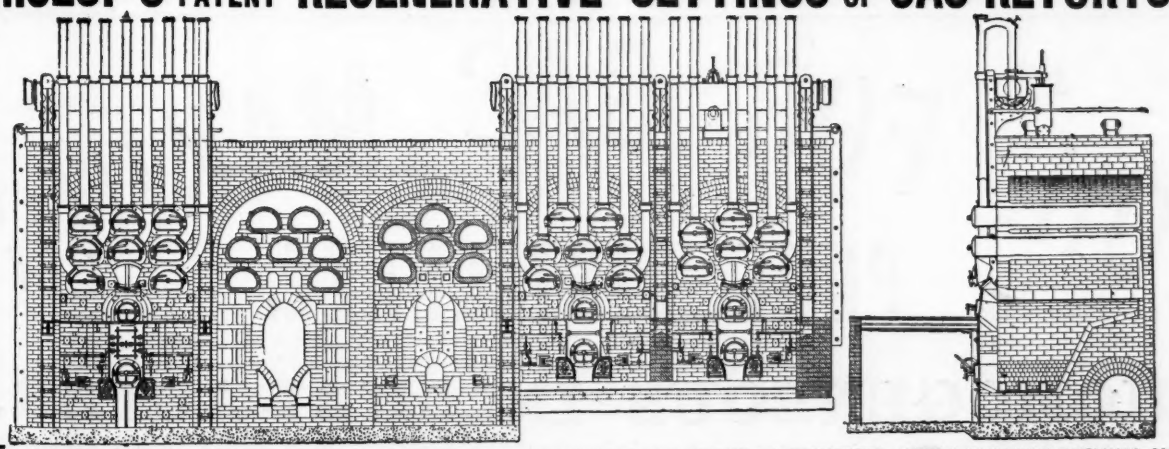
STOURBRIDGE, ENGLAND,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 17 TO 20 CWT. OF ENGLISH AND 20 TO 24 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, Hamilton, Agent for Scotland and Ireland. Principal Agent: **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B., to whom all Inquiries should be addressed in the first instance.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S Patents, all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.

Further Information and Pamphlets from Principal Agent.

ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING GAS-RETORTS.

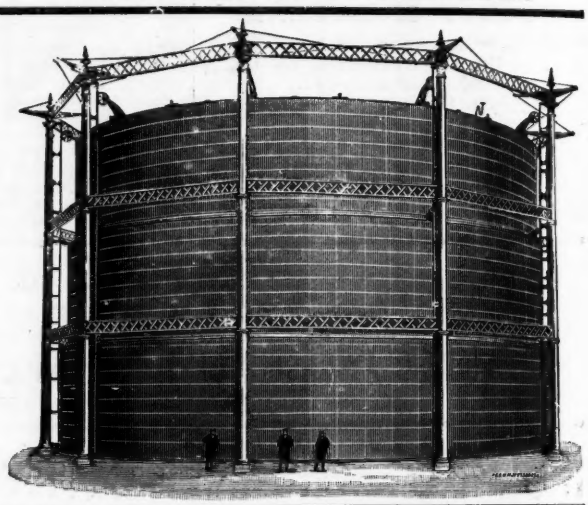
Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
[See Illustrated Advertisement, Dec. 7, p. 1259.]

TELEGRAPHIC ADDRESS: "GAS, LEEDS."
CLAYTON, SON, & CO.
LIMITED,
LEEDS,
MAKE
RETORT LIDS
OF ALL FORMS AND SHAPES IN IRON OR STEEL
BY SPECIAL HYDRAULIC MACHINERY.
LONDON OFFICE: 80, QUEEN VICTORIA STREET, E.C.
PRICES ON APPLICATION.

HANNA, DONALD, & WILSON,
(Established 1851),
GAS ENGINEERS & CONTRACTORS,
Abercorn Foundry and Abbey Works,
PAISLEY, N.B.,
MAKERS OF
Gasholders and Gas Plant
OF EVERY DESCRIPTION.

Sole Agents for Scotland for the Automatic Coal-Gas Retort (Inclined System) Company, Limited.

Telegraphic Address: "Donald, Paisley."



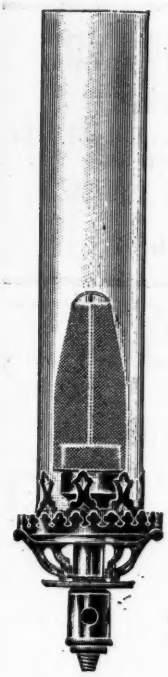
OIL FOR GAS MAKING
PURE DISTILLATE.
HOMOGENEOUS IN CHARACTER.
NO MIXTURE.
CAN BE STORED SAFELY ANYWHERE.
FLASH POINT GUARANTEED OVER 200° FAHR.
(ABEL'S CLOSED TEST.)

ANGLO-CAUCASIAN OIL COMPANY, LTD.
18 & 19, GT. ST. HELEN'S, LONDON.
INDIA BUILDINGS, CROSS ST., MANCHESTER.

THE SUNLIGHT INCANDESCENT GAS-BURNER.

NEW POPULAR PRICES.

BURNERS



COMPLETE FROM

3/10 each.

WITH BYE-PASS, 5/-.

MANTLES

per 9/- doz.

THE IDEAL LIGHT FOR DOMESTIC USE.

SUNLIGHT MANTLES

PRODUCE A DIFFUSED LIGHT OF SOFT RAYS,

The NEAREST APPROACH to the LIGHT of the SUN.

Price Lists, &c., on application.

The NEW INCANDESCENT (SUNLIGHT PATENT) GAS LIGHTING CO., LIMITED,

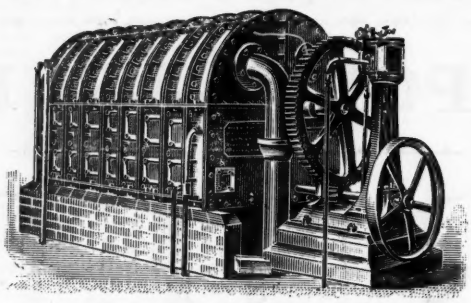
33 & 34, SHOE LANE, LONDON.

KIRKHAM, HULETT, & CHANDLER, LD.

3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

PATENT "STANDARD" WASHER-SCRUBBER.

This Apparatus upholds its title, the "STANDARD;" being recognized by leading Engineers as the most efficient Apparatus for the Extraction of Ammonia from Coal or other Gases.



The Largest Order ever given for WASHER-SCRUBBERS was recently received being for **16** Patent "Standard" Washer-Scrubbers, each for 3,500,000 Cubic Feet of Gas per day.

Number of Patent "STANDARD" Washer-Scrubbers in use at this date

540

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

Midland District Office: PRINCE'S CHAMBERS, 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.

TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

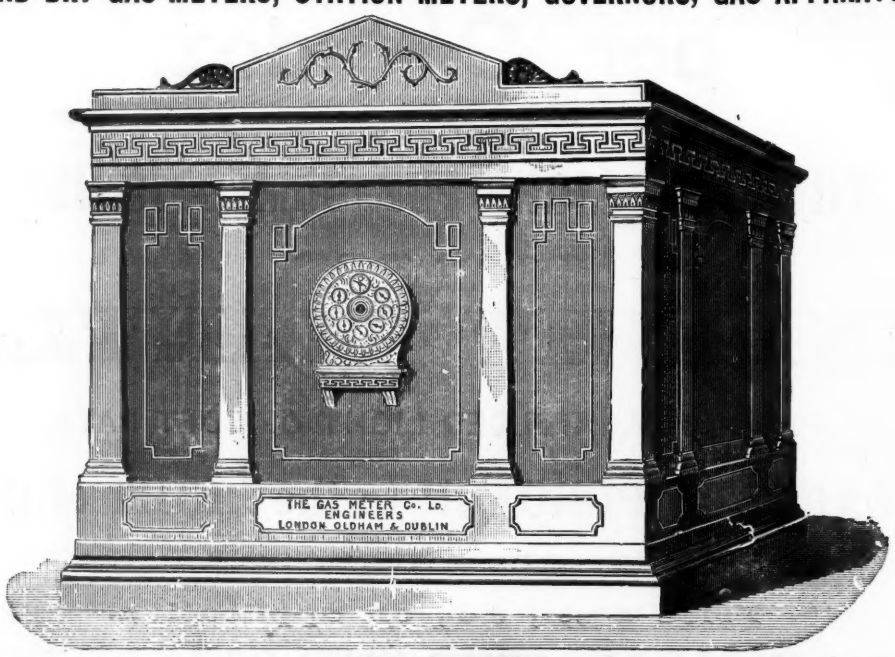
TELEGRAPHIC ADDRESS: "PARKER LONDON."

THE GAS-METER COMPANY, LIMITED

MANUFACTURERS OF

WET AND DRY GAS-METERS, STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.



STATION METERS IN CYLINDRICAL CASES.

DESIGN No. 2 PATTERN.

STATION METERS MADE AT THE COMPANY'S WORKS, OLDHAM, LATE WEST & GREGSON. Established 1830.

For Prices and Particulars apply to

R. L. ANDREWS, General Manager.

Works: 238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

Telegraphic Address: "METER."

[See Advertisement on back of Wrapper.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

SINCE 1893

MESSRS. HUMPHREYS & GLASGOW

Have constructed or have in hand

CARBURETTED WATER-GAS PLANT

FOR THE FOLLOWING UNDERTAKINGS:—

	Cub. Ft. Daily.		Cub. Ft. Daily.
Copenhagen	700,000	Norwich	1,000,000
Belfast	1,700,000	Holyoke, Mass.	600,000
Belfast (Second Contract)	4,500,000	Edinburgh	2,000,000
Glasgow	300,000	Stockport	500,000
Brussels	700,000	St. Joseph, Mo.	750,000
Brussels (Second Contract)	700,000	Lea Bridge	350,000
Liverpool	3,500,000	Lea Bridge (Second Contract)	350,000
Tottenham	750,000	Guildford	350,000
Tottenham (Second Contract)	750,000	Stockton-on-Tees	500,000
Santiago	400,000	Syracuse, N.Y.	850,000
Swansea	750,000	Brentford	1,200,000
Manchester	3,000,000	Commercial Gas Co.	850,000
Brighton	1,750,000	Commercial Gas Co. (Second Contract)	850,000
Preston	1,500,000	Bridlington	125,000
New York	1,200,000	Middlesbrough	1,250,000
Southport	750,000	Croydon	1,250,000
Bath	1,000,000	L. & N.W. Railway, Crewe	700,000
Newburgh, N.Y.	350,000	Taunton	225,000
Newburgh, N.Y. (Second Contract)	250,000	Lawrence, Mass.	400,000
Hoylake	125,000	Rotterdam	850,000
Coventry	600,000	Dorking	125,000
Coventry (Second Contract)	600,000	McKeesport, Pa.	500,000
Bordentown, N.J.	125,000	The Gaslight and Coke Co., Bromley	3,600,000
Winchester	200,000	The Gaslight and Coke Co., Nine Elms	2,650,000
Shanghai	225,000	New York (Remodelled)	11,000,000

LIVERPOOL (Second Contract) . . . . . 4,500,000 Cubic Feet.

In addition to which the 1891 Installations of The Gaslight and Coke Company, on the Humphreys' Double-Superheater System, have a capacity of 12,000,000 Cubic Feet per diem.

IN THE UNITED STATES,

Messrs. Humphreys and Glasgow and the United Gas Improvement Company have jointly constructed **248** Sets of Humphreys' Double-Superheater Apparatus; **135** of these since **1893.** This Company (of which Mr. Humphreys was formerly Chief Engineer) were, until lately, the largest Constructors of Carburetted Water-Gas Apparatus in the World.

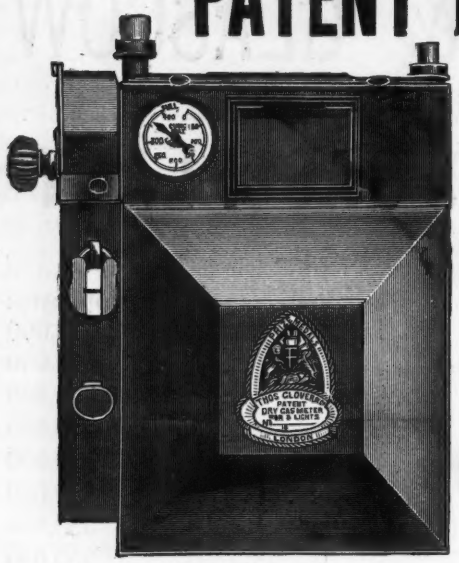
AT THE PRESENT TIME, MESSRS. HUMPHREYS & GLASGOW, OF LONDON, HOLD THAT POSITION.

9, VICTORIA STREET, LONDON, S.W.
Telegrams: "EPISTOLARY, LONDON."

UNITED STATES OFFICE:
BANK OF COMMERCE BUILDING, NEW YORK.

THOMAS GLOVER & CO.'S

PATENT NEW IMPROVED PREPAYMENT METER



For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC LONDON." Telephone No. 725 Holborn.

THOMAS GLOVER & CO., LTD.,
DRY GAS-METER MANUFACTURERS,
214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 28, BATH STREET. *Telegraphic Address: "GOTHIC."* Telephone No. 1003.

BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address: "GOTHIC."*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."*

GLASGOW: ARGYLE WORKS, KINNING PARK. *Telegraphic Address: "GASMAIN."* Telephone No. 1523 South Side.

PARKINSON'S
PATENT
EQUILIBRIUM GOVERNORS.

A very large number are now at work; and all Engineers who have adopted them speak in unqualified terms of their great efficiency.

COUNTERBALANCE or AIR VESSEL, as desired.
TWO, FOUR, or SIX COLUMNS and GIRDERS.
WEIGHTS or WATER PRESSURE.

COTTAGE LANE WORKS, CITY ROAD, LONDON. Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS, BIRMINGHAM. Telegraphic Address: "GAS-METERS."

[See also Advt. p. 1424.

CONTENTS.

EDITORIAL NOTES:—
GAS, LIGHTING, &c.— PAGE
A Retrospect of the Year 1897 1387
WATER AND SANITARY AFFAIRS—
The Principal Events of the Year 1897 1390
ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market. 1393
Electric Lighting in 1897. 1393
American Views of Street Lighting Systems 1394
NOTES:—
Chemical *v.* Bacteriological Examination of Contaminated Water. 1395
Additions to Portland Cement 1395
The Transparency of Flame. 1395
A Rapid System of Sounding 1395
Researches on Lime Burning 1395
The Economical Generation of Steam. 1395
The Design of Structures with Regard to Maintenance. . . . 1395
TECHNICAL RECORD:—
The Tradeston and Dawsholm Gas-Works of the Glasgow Corporation 1396
The Illumination of Enclosed Space. By Dr. W. H. Birchmore. 1398
REGISTER OF PATENTS:—
Mantles for Incandescent Burners—Burgess, J. F. 1399
Generating and Burning Acetylene—Thompson, W. P. (Gobron, A.) 1399
Production of Acetylene—Thorp, T., and Marsh, T. G. . . . 1400
Manufacture of Acetylene Gas—Wise, W. L. (Paitti, A., and Co.). 1400
Gas-Lanterns—Biheller, S. (The Actiengesellschaft, vorm C. H. Stobwasser and Co.) 1400
Producing Acetylene Gas—Barthez, A. H. 1400
Manufacture of Anhydrous Ammonia—Krebs, H. J. 1401
Producing and Storing Acetylene—Bell, H. J., and the Niagara Falls Acetylene Gas Machine Company 1401
Burner for Acetylene Gas—Lebrun, G., and Cornaille, F.. . . 1401
Gas and Mineral Oil Motors—Martha, L.. 1401
Inclined Retorts—Cliff, W. D., and the Leeds Fire Clay Company, Limited 1401
Production of Acetylene Gas—Bosshardt, F. (Molet, A.) . . . 1401
Patent Notices 1402
CORRESPONDENCE:—
Destructor Furnaces and Electric Lighting 1402
A Three-Storeyed Gas-Works 1403
Gas Workers' Superannuation 1403
LEGAL INTELLIGENCE:—
Supreme Court of Judicature—Court of Appeal—
Incandescent Gas-Light Company, Limited, *v.* Reimer; Discharge of a Committal Order 1403
Brebner *v.* The Urban District Council of Aberdare. . . . 1403
The Incandescent Gas-Light Company's Patents 1403
Unlawfully Illuminating an Empty House 1404
MISCELLANEOUS:—
Extensions at the Widnes Gas-Works—Opening of a New Retort-House. 1404
Meeting of the Automatic Gas-Retort Company, Limited . . . 1404
Public Lighting by Incandescent Gas-Burners at Adelaide . . 1405
Gas and Gas-Meters in Greater New York 1405
The Gaslight and Coke Company's Capital Conversion Scheme. 1405
The Proposed Amalgamation of the Redhill and Reigate Gas Companies 1406
The Electric Lighting Scheme of the Tottenham and Edmonton Gas Company 1406
Electric Lighting Notes 1406
The London County Council and the Thames Conservancy—The Alleged Pollution of the River. 1407
Water Supply and Epidemics 1407
The Fight for the Todmorden Water-Works—The Rochdale Bill Rejected at a Town's Meeting 1407
The Additional Water-Works for New York—The Construction of the Jerome Park Reservoir. 1408
Notes from Scotland 1409
The Lancashire Coal Trade during 1897 1410
Coal Trade Reports 1411
Current Sales of Gas Products 1411
Gas and Water Companies' Stock and Share List 1409
PARAGRAPHS:—
PERSONAL: Mr. F. W. Johnson; Mr. B. G. Venner 1395
OBITUARY: Mr. Bailey Blackburn; Mr. John Stone-Wigg . . 1395
A Large Coal Contract—The Approaching Dissolution of the Commissioners of Sewers—Johnson's Investment Tables . . 1390
A Safety Ladder Grip—Natural Gas at Waldron—The Testing of Explosives for Use in Coal Mines 1393
Gas Tramways in Holland 1394
Fatal Gas Explosion at Bristol 1403
Langton Matravers Water Supply 1410
Sales of Shares—The Legitimate (?) Action of Trade Unionism . 1411
Terrible Results of an Explosion at a Hull Tar Distillery—Gas Workers and their Demands—Water Supply and Epidemics . 1412
Water Supply in London and New York—Pollution of the Thames—The Carlisle Water Scheme and the Outlying Villages—Shipley Water Supply—The Gas Workers' Union—Fatality at the Manchester (Bradford Road) Gas-Works . . 1413

TO ADVERTISERS.

UNDISPLAYED ADVERTISEMENTS—Situations Vacant and Wanted, Apparatus Wanted and for Sale, Contracts, Public Notices, &c.:—

Six Lines and Under (about 42 words) . . . . . 3s. 0d.
Each Additional Line 0 6

Quotations for Trade Advertisements, Prospectuses of Public Companies, &c., on application to the Publisher.

All communications, remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegraphic Address: "GASKING LONDON."
Telephone Number: Holborn 121.

EDITORIAL NOTES.

A Retrospect of the Year 1897.

THE approach of the end of the year once more reminds one forcibly of the flight of Time. We are constrained to look back over the events of the year that is so nearly past, and take account of the prospects with which the New Year opens. For Englishmen, one event of the year 1897 looms up in the retrospect, and marks the epoch. It is the celebration in June of the Diamond Jubilee of Her Most Gracious Majesty the Queen, when the people of our nation realized, as the fact had never been realized before, what is the position of the British Empire in the world. Never had the might, majesty, dominion, and power of the realm of England taken such palpable shape as on this historic occasion, which alone would mark the era as memorable beyond ordinary. But indeed the year apart from all considerations arising in connection with the Diamond Jubilee, has been full of portentous events. Financial and mercantile activity has been very marked and persistent throughout the year; the national revenue reached the unprecedented figure of 112 millions sterling; and abundant evidence exists to prove that the people who in their various degrees contributed this enormous amount to the national exchequer, were very much better off than their predecessors of any earlier generation.

The financial position of the gas industry was well maintained. The price of some leading gas stocks was not quite so high at the close as it was at the beginning of the year; but the return upon investment in any of the gas stocks regularly quoted in our list worked out pretty uniformly throughout the year. Perhaps the best indication of the estimation in which gas stocks and shares generally were held by the investing public is to be found in the results of the auction sales which have of late become so popular an agency for placing new issues of the kind. Our last report of an important gas stock auction relates to the sale by Mr. Alfred Richards, on Nov. 30, of some 6 per cent. perpetual debenture stock of The Gaslight and Coke Company, which realized an average price of £207 9s. 2d. per £100 of stock—thus returning to the purchasers £2 17s. 10d. per cent. Ordinary stocks of some of the largest Metropolitan, Suburban, and Provincial Gas Companies have been sold to good advantage in this way, which is as convenient for the issuers as it is fair for the purchasers of new stocks and shares. Speculation has been very busy with some of the departments connected with the gas industry. The coal trade was pretty quiet; but the financial side of the trade in gas-burners, meters, and some other accessories and derivatives of gas, exhibited a good deal of liveliness. A Joint Stock Company with the name "Meters Limited"—being a combination of several firms engaged in this trade—came out in October with a capital of £500,000; and at the very end of the year an amalgamation of all the Welsbach incandescent gas-light interests was effected, with a capitalization of 3½ millions sterling. It was expected all the year that an attempt would be made to "boom" calcium carbide, but nothing of the kind occurred.

The case of gas-works residuals was during most of the year as bad as it could be, and yet leave the markets open. The condition of the trade in London coke was a sore point with both producers and dealers. Considerable augmentation of gas consumption was signalized everywhere. Increases after the rate of 10 per cent. and more were not by any means uncommon, which was satisfactory as showing the growing popularity of gas for every purpose. But though this rapid growth kept engineers and gas-works contractors busy, the residuals of gas production were not in so keen demand as gas itself. The fuel market hardened slightly; and consequently coke was saleable, at a price. The fact of coal prices rising at least 6d. per ton could not but react upon the value of coke. Sulphate of ammonia began the year weakly, at about £7 17s. 6d. per ton, and closed last week fully £1 better, with an upward tendency. It would be difficult to assign a cause to this movement. In the spring of the year, when the sulphate market was at its lowest, a Committee of producers was formed with the object of doing something for the benefit of the trade, and to get up a

counterblast to the Nitrate Committee whose operations were credited with having unduly raised the selling price of this product. The associated sulphate producers volunteered to tax themselves to the extent of 6d. a ton of their output in order to found a prize and advertisement fund; but no public measures have been taken. Tar, unfortunately, went very much to the bad during the year. Taking the country through, tar was quoted at 17s. 6d. to 23s. 6d. at the beginning of the year; and 14s. to 19s. per ton at its close. Benzols fell heavily; and pitch and all other tar products were in the same case. Anthracene was only worth one-half the money in December that it commanded in January. In these circumstances, it is not to be wondered at that little was heard during the year of the once-famed idea that tar distillation should be carried on in gas-works. Nor was notable progress made with cyanide recovery in connection with gas manufacture. To apply a famous saying, no new residual was evoked to redress the balance of the old.

One effect of the additional experience gained by gas managers of the essential unreliability of residuals was the concentration of their attention upon the staple of their business. It is a sound maxim in trade that when a business is thriving and growing is the right time to push and improve it to the utmost. The extraordinary increase of gas consumption exhibited last year has already been mentioned; but it is worth remarking again because it was one of the salient features of the era. In many localities it seemed as if the public could not get enough gas; and the demand enabled engineers everywhere to realize many long-wished-for improvements of plant and methods. For there are towns where the gas undertaking had fallen into the hands of timid administrators, who could not bring themselves to countenance large schemes of works improvement. During the previous ten years, whenever the works manager asked for new plant, somebody would raise an alarm, and plead against the idea of spending capital upon an undertaking which was about to be superseded. But last year, and the year before, the truth was again revealed. It was impossible to contradict the evidence of the rental ledgers; and so once more the engineers had their hands freed.

New works construction as well as the remodelling of old works were on all sides the orders of the day. And wherever schemes of the kind were entered upon, signs of progressive designs were to be noted. It is not so many years ago that when a new retort-house was needed, an old one could be duplicated without exhibiting an anachronism. Nowadays the new carbonizing plant is very different from the old; and such plant has grown old very quickly of late. The gas manager who is up-to-date must have labour-saving plant upon the most approved models, or be able to give a sufficient reason for dispensing with it. Inclined retorts, machine stoking, coal and coke conveying machinery, gaseous firing—these things make the modern retort-house a very different structure and place of labour from the old. It costs twice or three times the price of a retort-house of thirty years ago. But capital is proportionately cheap; and labour is so much dearer that structural cost is as nothing to working expenses. A bolder note has been struck in gas-works design. New plant is planned upon a more generous scale. Gasholders are twice as big as they used to be; for, in a larger sense than ever, the engineer realizes that he has a future to provide for.

The prepayment consumer's meter has had a good deal to do with the production of the state of things described in the foregoing paragraph. The gas-stove and the incandescent gas-light have also in their place and degree contributed to it. It is only with a mental effort that one can now imagine what the gas industry would be like if there were no gas-cooking stoves or fires, no gas-engines, no prepayment meters, and no burners but the flat-flame and the argand. And yet all these commonplaces of the modern industry are creations of the past few years—very few, in the case of the last named of them. Hardly one of them was thought to be wanted, or was very heartily welcomed when it came. Yet they are all the bases of important industries, employing large amounts of capital, and affording employment to goodly numbers of people. One can scarcely survey the field they occupy without wondering what will be the next development of the same kind. The closest examination of the industrial horizon does not reveal at the moment anything of the sort; yet it cannot be thought that the possibilities of invention and adaptation are exhausted in regard to gas.

The gas politics of the Metropolis and of other principal cities and centres of population in different parts of the world have been interesting enough during the past year to call for special notice. A long chapter of the history of The Gaslight and Coke Company was closed by the death at midsummer of Mr. John Orwell Phillips, under whose direction the amalgamation policy had raised the original Chartered Gas Company to the pre-eminent position occupied by this vast undertaking to-day. The vacancy on the Board created by the lamented death of Mr. Phillips was filled by the appointment of Mr. Corbet Woodall. This appointment was regarded as materially strengthening the Board, whose administration of the affairs of the Company had for years previously been severely criticized by independent authorities on the subject. Meanwhile, the Directors have been engaged in the preparation of a scheme for the unification and conversion, upon a 4 per cent. basis, of the Company's ordinary stock—all their numerous preference stocks being converted into a consolidated 4 per cent. preference stock, and the debenture stocks replaced by an equivalent amount of 3 per cent. debenture stock. This would make the nominal amount of the Company's capital correspond very nearly with its actual market value. The idea was duly approved by the proprietors in general meeting; and the Bill whereby statutory power is to be obtained for carrying out the scheme has been duly deposited. The South Metropolitan Company obtained a new Act, without opposition, permitting of the election to the Board, under certain conditions, of workmen directors. The Company's profit-sharing scheme and accident compensation fund were further developed, and attracted considerable attention for their merits as an accredited remedy for labour troubles. The Company had a severe tussle with some of the rating authorities of their district, and threatened reprisals for over-assessment in the form of an increased price for the gas supplied in certain parishes; but an amicable adjustment of all their differences was ultimately concluded. The Commercial Gas Company experienced their full share of the unprecedented growth of the popular demand for gas, and were compelled to make use, after a long interval, of their exceptional powers for issuing fresh capital at par to the existing proprietors. The Directors had been urged by some advisers to give up this now antiquated privilege; but the new issue was made in the old way, and was not all taken up—a balance of 10 per cent. of the amount being left to be sold by auction.

The section of the financial world which is interested in gas supply was considerably perturbed during the year by the outrageous treatment to which the Imperial Continental Gas Association were subjected by the Vienna Municipality. The approaching termination of the concession for the Vienna undertaking of the Association was the occasion of negotiations being opened up between the Association and the Municipality for a renewal of the treaty upon terms highly favourable to the city, or in the alternative for a sale of the works and plant to the city at the low valuation of £1,330,000. The City Council, however, had been captured by the anti-Semitic party under the leadership of Dr. Lueger, who would have nothing to do with the Association, and proceeded to originate new municipal gas-works and distributing plant. A difficulty arose in the way of the city obtaining the necessary capital for this adventure; and at the end of the year the financial deadlock continued. Rumour was busy over the prospects of yet another consolidation of the Gas Companies supplying New York—this time under the auspices of the Standard Oil Company. Considerable interest, too, was excited in the transfer of the gas supply of Philadelphia from the Municipal Trust which had mismanaged the business for years, to the United Gas Improvement Company.

Parliament was busy last session with legislation of a general character touching the home gas industry more or less closely. The great legislative work of the year was an Act for extending the liability of employers to compensate workmen for injuries received in the course of their ordinary employment. The Workmen's Compensation Act, as it is popularly termed, applies to all gas-works which rank as factories. The House of Commons discussed a Bill for the Registration of Plumbers, and one or two other futilities of the kind. The Private Bill business relating to gas supply was of considerable volume

and importance, chiefly centring in the question of transfer of undertakings to local authorities. Legislation, sometimes followed by arbitration proceedings, dealt with the gas interests of Hull, St. Anne's-on-Sea, Ashford, Matlock Bath, West Cowes, Hunstanton, Ystrad, Ambleside, and one or two smaller districts. The Chesterfield Gas and Water Company was wound up; and there was talk of acquiring the gas undertaking by the Corporations of Leamington, Falmouth, Totnes, and many other places. The movement for municipalizing gas supply revived all over the country; but no alteration of the established procedure in such cases is to be recorded. No piratical schemes involving forcible expropriation were sanctioned; and all the gas property transferred was paid for at its full value. The excessive cost of some of these Private Bill proceedings and arbitrations amounted to a scandal. The reform of Private Bill procedure was talked about as usual; but, of course, with no tangible results.

The gas litigation of the year was not heavy. The responsibility for the breaking of gas-mains by steam-rollers was put upon the local highway authority in the case of *Driscoll v. The Poplar Board of Works*. A decision of the Railway and Canal Commission justified the railway companies in refusing to carry 21 cwt. of coal for a ton. An important nuisance case at Plymouth was a cause of much outlay, and gave considerable trouble to the Gas Company. There was some tedious and vexatious litigation between Southport and Birkdale over gas-testing. The legal position of the consumer's meter as furnishing only a *primâ facie* record of the quantity of gas consumed was confirmed in several cases; and a decision establishing the property in hired gas-engines was given in the case of *Hobson v. Gorringe*. Litigation in regard to gas plant and burners was rampant—the Incandescent Gas-Light Company almost keeping a Chancery Court going with the hearing of infringement actions. The patent right in regard to inclined retorts was established by an action against the Salford Corporation. The almost-forgotten water-gas scandal was exposed in a libel action brought by Samson Fox against a journalist who had ventured to tell some unpleasant truths about his operations.

A subject that attracted more attention during the year than almost everything else, the Diamond Jubilee not excepted, was the conflict of organized Labour with Capital, which came to a head in various and sundry places, and still rages in the distracted engineering trade. It seemed that all the forces and influences that have come to be recognized by the term "Labour"—Socialism; Trade Unionism; the "ism," whatever it was, which inspired the old frame-breakers and threshing-machine burners; Anarchism; plain old original laziness and preference of talking to work—burst into action last year. Actually, as these lines are being written, the most portentous industrial struggle of the century is still being waged over the question of whether the "Union stroke" is to prevail in engineering workshops, or whether the employers are to get a fair day's work for a fair day's pay. Early in the year, trouble broke out at the Bethesda slate quarries owned by Lord Penrhyn, because the owner wanted to manage his business in his own way. The cause of "Labour" was supposed to be outraged by this view of the rights of ownership; and a strike of quarrymen took place which was only terminated at the end of 48 weeks by an unconditional acceptance by the strikers of the terms offered to them from the beginning. While the quarrymen's strike was in full swing, trouble that had long been brooding in the engineering trade came to the surface in the North-East Coast district. The Amalgamated Society of Engineers had been agitating the question of who should attend self-acting machine tools; and the matter came to an issue at Sunderland in March. The employers, who had already begun to federate in view of the certainty that this and other vital questions of their industry would be opened up by the Trade Union sooner or later, were prepared to fight it out there and then. But the men's leaders saw that it would not serve their purpose to join issue on the machine question pure and simple. Consequently, the difficulty was composed for the time; and a conference of employers and Trade Unionists was held on the subject early in April, only to prove abortive. The storm was merely delayed, and not for long. Early in May, a Joint Committee of the Trade Unions connected with mechanical engineering addressed a peremptory demand to employers in the London district for a reduction of the working day to eight hours, without any reduction of pay. The demand was rejected; and the employers, seeing what was coming, proceeded to close up their ranks, and agreed to meet a strike by the counter-stroke of a lock-out. The first week in July saw the storm break. The men's leaders thought they had a good "cry" in the demand for a working day of eight hours; and so it proved. For while the popular newspapers and the politicians upon whom they depended for sympathy and support, could not have defended their view of the machine question, the new cause was something that would tickle the public ear. From this time onward the strike and lock-out have extended; and the issues have deepened, until now the only real question to settle is who shall be master in the shops—the employers or the Trade Union. A conference of representatives of the two parties to the dispute was held at the end of November, when the masters' terms of settlement were promulgated. These were rejected on a ballot of the strikers; but a revised edition has again been submitted to the men.

The effervescence of "Labour" has given to the Law Courts some difficult questions of right to dispose of; and it cannot be said that the ponderous machinery of English law has adapted itself with conspicuous success to the conditions presented by litigation where all the responsibility is on one side and all the power for mischief on the other. In the case of *Bailey and Another v. Pye and Others*, a firm engaged in the business of glass bevelling obtained a verdict with heavy damages against a Trade Union Secretary who had caused certain workmen to break their contracts with the firm, and done other illegal things in connection with a strike. Though the defendants could sustain the action and fee eminent Counsel on their behalf, they could not be made answerable for the taxed costs of the suit and damages, amounting to £1217. The total loss to the firm, with seven months' picketing, was estimated to reach £2000. Another and an even more far-reaching miscarriage of justice was perpetrated in the name of the law by the decision of the House of Lords in the case of *Allen v. Flood*. Here it was not the responsibility of the Trade Union that failed, but the incapacity of the civil law to reach the agitator through a terrorized employer whom he had instigated to discharge journeymen obnoxious to the Union. The case was remarkable as showing that ten Judges of the High Court did not know the law; for this number of puisne Judges as well as Lords Justices of Appeal thought that a person who maliciously procures another to commit an act, not in itself illegal, from which a third person sustains an injury, can be made answerable for his deed. This is now settled to be an erroneous reading of the law. Though there was no question of conspiracy in *Allen v. Flood*, the judgment has already quashed a later action against a Trade Union official for having interfered with liberty of employment amid circumstances from which conspiracy was not altogether absent. Hence the law in this regard must be considered to be in a distinctly weak and unsatisfactory state.

In regard to scientific discoveries and inventions relating to gas, the year must be held to have exhaled the odour of acetylene throughout its whole course. Carbide of calcium and acetylene received the stamp of Government regulation; but practical lighting by acetylene cannot be said to have made headway. This was not for the want of suggestions aiming at a more favourable result. Novelties in fuel gas were introduced by Mond in England and Dellwik in Germany. Modifications of the atmospheric burners used for incandescent gas lighting were produced by Denayrouze and Bandsept. Another modification of incandescent gas lighting, in which a forced blast was required, was tried in London under the name of the Somzée-Greyson system. Meanwhile, the Welsbach system received a large development for street lighting; and a beginning was made in the adaptation of the system to mineral oil lamps. Active and persistent efforts were put forth to apply mechanical traction successfully to road vehicles; and gas-power for drawing tramcars was exemplified on a working scale at Blackpool. A new Harcourt 10-candle pentane standard lamp for testing purposes was introduced. The adoption of carburetted water gas has made rapid progress in the United Kingdom.

The list of accidents and casualties in British gas-works does not contain any grave catastrophe; but the number of fatalities scattered singly over the country showed an increase over the tale of some previous years.

Suspicions of the toxic character of carburetted water gas were rife in places; but nothing transpired to throw any fresh light on this old problem. The subject of gas in electric lighting subways, which at one time threatened to be somewhat troublesome, grew quiescent after it was made known that the responsibility for the safety of these conduits rested upon the owners.

All the technical societies connected with the gas industry fulfilled their mission creditably. The Institution of Civil Engineers broke fresh ground by holding a general Engineering Conference in London, and also effected an important alteration of the conditions of admission to membership. The Gas Institute held a successful meeting at Bath, under the presidency of Mr. C. Stafford Ellery. The Institution of Gas Engineers also flourished under Mr. Corbet Woodall, who achieved great glory for his conduct of the autumn meeting of the Institution in Holland and Belgium. The Southern District and the South-Western District Associations of Gas Managers became amalgamated. The North British and the various District Associations amply justified their existence.

Our obituary for the year is long, and contains some names of those who had much to do with the making of the gas industry what it is. The greatest name of all is that of Mr. John Orwell Phillips, one of the strongest men who ever threw in his lot with this industry. Mr. David Clarke, of Ashton-under-Lyne, was a good representative of the old type of gas manager—of the men, that is to say, who rose from the ranks by sheer personal merit, and through their single-minded acceptance of the principle that their employers' interest was also their own. Mr. William Wood, of Bradford, was also a man of long practical experience. Mr. Frank Mead, of Sutton, died comparatively young; nor did his father, Mr. C. R. Mead, long survive him. Mr. Robert Mitchell, of Edinburgh, did not live long after his retirement from active service. Mr. V. Wyatt, the engineer who assisted in the building of Beckton, was a master of construction.

And now our task draws to its close. We cannot pretend to have recalled all the important and interesting events in the year's history of so vast and complex an industry as that of the gas supply of the United Kingdom; but we have tried to note its most salient features in their place and degree. Year by year this task becomes more laborious, as the industry grows and develops. This expansion apparently gathers speed as time goes on. The two volumes of the "JOURNAL" which contain the year's record are bulkier than any of their precursors; and even so it has not been easy to keep the technical chronicle close up to date. The year that now opens before us breaks in the midst of clouds; but we believe that for all British industries, including that of gas supply, the sun of prosperity is still shining, and that the Future will prove brighter as well as larger than the Present or the Past.

A Large Coal Contract.—A contract has lately been signed which is said to mean a great boom to the Nova Scotia coal industry. The New England Gas Company, with a capital of $17,000,000, have entered into an agreement with the Dominion Coal Company of Montreal for the delivery of 800,000 tons of coal yearly in Boston, with the right to receive 1,500,000 tons at the same figure. The contract is said to be twenty years.

Johnson's Investment Tables.—Those of our readers who are specially concerned with investments in gas and water stocks have recognized the value of a ready means of quickly arriving at the return realized thereon. With the view of assisting them, Mr. Alfred Richards has obtained permission from the proprietors of the above-named tables, which give the return per cent. per annum on the market price of stocks or perpetual debentures paying rates of interest varying (in ¼ per cent.) from 1 to 10 per cent. per annum, to issue them with an explanatory note of his own, showing how they can be made to apply to stocks and shares of smaller denomination than £100. He has thus enhanced the value of a book of acknowledged utility.

The Approaching Dissolution of the Commissioners of Sewers.—In the "JOURNAL" last week we recorded the approaching absorption of the Commission of Sewers by the Corporation of the City of London. The event is by no means an unimportant one, for it must be acknowledged that, on the whole, the Commissioners have managed very well the cleansing, draining, paving, lighting, and general improvement of the City streets. It will be interesting to note how this work is carried out in the future. It is somewhat remarkable, as pointed out by a contemporary, that this body, which was called into existence after the Great Fire of London, should pass away immediately after one only a little less disastrous, and probably never equalled during the two centuries it has been working.

WATER AND SANITARY AFFAIRS.

The Principal Events of the Year 1897.

THE Queen's Speech at the opening of Parliament last January contained an announcement that a Bill would be introduced for the purpose of improving the arrangements for the supply of water to the Metropolis. The statement thus made left little hope for the eight Purchase Bills of which the London County Council had given notice; and the promised Water Bill of the Government was forthwith denounced by a leading Progressive organ as one more device on the part of Mr. Chaplin "and "his reactionary friends" to save the Water Companies from any danger of being bought up. On the other side, it was argued that it needed no Government Bill to extinguish the designs of the County Council in respect to the water undertakings. Even at Spring Gardens the Purchase Bills had only been approved by a majority of seven; and there were prophets who not only declared that the Bills were "foredoomed to failure," but that the Council were themselves quite aware of the impending collapse. Desperate as the case may have appeared, there was an active party engaged in support of the purchase scheme; and the Water Committee of the County Council made strenuous efforts to gain the support of the authorities connected with the outer areas. Provisional agreements with these authorities were arranged by the Council's Parliamentary Committee, and were approved by the Council; the gist of the scheme being to sever the outlying portion of "Water "London" from that of the Administrative County—each of the outer authorities being allowed to take the local supply into their own hands, subject to certain terms of purchase to be settled with the London County Council. The plan had the drawback of effecting an artificial division of the water area—supposing it to be possible—and superseding the eight Metropolitan Water Companies by seven or eight other bodies; thus accomplishing nothing towards consolidation. Lord Onslow and Sir J. Lubbock were conspicuous opponents of the scheme; the former declaring that the interests of London had been grossly neglected in the negotiations.

An ingenious plan for the amalgamation of the London Water Companies was brought forward in a Public Bill by Sir F. Dixon-Hartland and others. But it was objected to on Standing Orders by Mr. Cripps on behalf of the London County Council; his contention being that the measure should have been preceded by the usual statutory notices observed in the case of Private Bills. The Examiner, Mr. Campion, considered the Bill to be "an "attack" on the London Water Companies, inasmuch as it aimed at "their possessions;" and he was of opinion that notice should have been given. The Bill was accordingly sent before the Standing Orders Committee, and the objection advanced proved to be fatal. The Companies, it may be observed, offered no opposition to the scheme; and the Bill had the merit of involving no addition to the ratepayers' burdens. But something more decisive than a breakdown under Standing Orders befell the Council's Purchase Bills. These were rejected by the House of Commons, on the motion for the second reading, by 258 votes against 123, after a debate which occupied five hours. In place of the Purchase Bills of the Council, the Government offered a twofold undertaking, consisting of a Royal Commission to investigate certain unsettled questions relative to the Metropolitan Water Supply, and the introduction of a measure "to strengthen and improve the position of the "water consumers in the Metropolis." The course adopted by Government became the more significant when viewed in connection with the arguments used by its members. Thus, Mr. Chaplin asserted that he would be a bold man who should contend that the policy of purchase in respect to the London water undertakings would be the most economical mode in the interest of the ratepayer. Mr. Chaplin also demurred to the proposal for separating the outer area from the inner, involving the creation of a number of separate water authorities outside the Metropolitan boundary. A few days later, Lord George Hamilton, presiding at a meeting of the London Municipal Society, objected to the policy of the Progressive party in the County Council on the subject of the water supply. The remarks of Lord George were, of course, to be taken apart from his connection with the Cabinet; but they

nevertheless possessed peculiar weight. The Progressives he described as actuated by "an insane craze" to multiply the duties of the Council; and he referred to the Council's Water Bills as an illustration. The vexation of the Progressives at the defeat of their purchase scheme took a curious form; Mr. Boulnois being denounced by Mr. Benn, in a subsequent meeting of the Council, as the "chief "executioner" of the rejected Bills. Had Mr. Benn been a member of Parliament, he would perhaps have levelled his attack against Mr. Chaplin; but as it was he contented himself with an onslaught upon Mr. Boulnois, to whom he attributed an extraordinary influence in directing the course of legislation.

A contest in Whitechapel which resulted in the election of a Progressive candidate to the County Council elicited a strong denunciation in the leading columns of "The "Times" with respect to the tactics pursued on the successful side. The question of the water supply of East London was involved, and an "impudent perversion of "facts" was charged upon those who sought to make political capital "out of the shabby and shallow device "of preventing the East London Water Company from "obtaining the powers it sought for the construction of "new reservoirs, and then denouncing it as the culpable "author of all the suffering which those reservoirs would "have averted." In the controversy arising out of the Whitechapel election, Mr. Shaw Lefevre endeavoured to justify his opposition to the East London Water Bill of 1894 upon grounds which "The Times" declared to be preposterous, and which were subject to what was well described as "a scathing analysis" by Mr. Banbury. A letter from Mr. Crookenden, the Company's Secretary, still further completed the discomfiture of Mr. Shaw Lefevre, one of whose fallacies, or hallucinations, consisted in asserting that Mr. Bryan, the Company's Engineer, had stated in evidence before Lord Balfour's Commission that the district was fully provided with water for years to come. The Commissioners made no mistake, but clearly understood Mr. Bryan to mean that there was abundance of water; the only requirement being the construction of reservoirs and works for its distribution.

But over and above all these errors and their correction, there came on the 30th of March a specific announcement from Mr. Chaplin with regard to the terms of reference to the new Royal Commission. In the first place, the Commissioners were to inquire whether it was desirable that the undertakings of the Water Companies should be acquired and managed by a public authority, and whether "several authorities" would be preferable to one. To what extent should or could physical severance of the works take place? If the undertakings were not acquired, what additional powers of control should be exercised by local or other authorities? Finally, was it practicable to connect any of the existing systems of supply? All that lay outside the inquiry conducted by the Royal Commission under Lord Balfour was thus comprehended, and every contingency seemed to be provided for, while at the same time nothing was prejudged. Financial considerations were prominent, and with sufficient reason, seeing how little light had previously been thrown upon this part of the subject. The party who were anxious to see the Metropolitan Water Supply made one of the possessions of the County Council inveighed against the Royal Commission as one more device for delay, and as a further development of the "plot against London." It rendered hopeless the design which had been entertained to "rush "the water supply," to obtain possession first and settle the price afterwards, and to commit the ratepayer to such future water schemes as the County Council might devise. The Water Companies, who may be said to have had everything at stake, made no objection to the Royal Commission; confident as they are that they will never be condemned by an able and impartial tribunal.

Early in May, the constitution of the Royal Commission was announced. Lord Llandaff, who as Mr. Henry Matthews held the office of Home Secretary under Lord Salisbury, had already been offered the chairmanship, and had accepted it. The Commission was a strong one, including such men as Mr. Mellor, Sir John Dorington, and Sir George B. Bruce. In all there were eight. The answer of the County Council was to be found in their estimates, where they put down £2500 as requisite to defray the cost of preparing evidence to lay before the Commission, in addition to which it was proposed to expend £5000 in the conduct of inquiries into areas of supply, and in other ways, with a view to the promotion of a Bill in Parliament relative to the water supply. The Bill has not yet made its appearance; and as the Council expended more than £4000 on the Water Question in 1896, the ratepayers may be content to wait for it. As for Mr. Shaw Lefevre, ex-President of the Local Government Board, he "thoroughly distrusted" the result to be expected from the Royal Commission, and considered that the conduct of the Government in relation to the Water Question was "scandalous." Towards the end of May, the intentions of the Government were further disclosed by the production, at the hands of Mr. Chaplin, of what was then called the Metropolitan Water Companies Bill. Assuming that the Royal Commission would bring about some change in the position of the water supply, this unpretending measure was simply put forth as a temporary provision. Its design was to enable a private consumer to obtain redress for any real grievance he might have against the Water Companies; the Railway and Canal Commissioners being appointed as the authority to hear his complaint and adjudicate upon it. A local authority might in like manner complain, or might aid any water consumer in obtaining the determination of any question of interest to water consumers in the district. An important clause in the Bill extended the operation of the Metropolis Water Acts of 1852 and 1871 to the entire extent of the parliamentary districts of the Companies; thus covering the whole of the outer area in common with the inner. Though there was a tendency in the first instance to look upon the Bill as a small affair, and Mr. Chaplin himself described it as "short, simple, and "modest," it grew in favour with Parliament, and was ultimately passed, subject to an amendment which made it operative two months earlier than was originally proposed. The consumers have not yet brought any grievances under the notice of the Railway Commissioners, though it has recently been stated that the County Council have been diligent in trying to rouse individual consumers to action. There seems a difficulty in finding a grievance.

While the Water Bills of the London County Council suffered shipwreck in Parliament, those of the Metropolitan Water Companies passed safely through, or received little damage. The debate on the second reading of the East London Water Bill in the House of Commons was marked by unusual moderation. The Bill of the Southwark and Vauxhall Company encountered opposition of a most obstinate character from the London County Council, though only designed as a temporary measure to legalize an extra draught of water from the Thames, pending the introduction of a Bill of a permanent character in the session of 1898. When the Bill came on for its third reading in the House of Commons, Mr. Stuart moved that it should be re-committed, in order that some further evidence against it might be heard. But the judgment of the House was so decidedly adverse to the amendment, that Mr. Stuart had to withdraw it. The Bill was met with some amendments by Lord Tweedmouth in the House of Lords; but it was read a third time, and passed with very slight alteration. The Bill of the New River Company was approved by the Select Committee of the House of Commons, on condition that a sinking fund clause was introduced. The Act obtained by the East London Company provided for the construction of two additional storage reservoirs at Tottenham, with the necessary subsidiary works; and power was given to the Company to enter into agreements with other London Water Companies for mutual assistance. Debentures to the extent of £500,000 might be issued by the Company, subject to redemption at par after twenty-five years. A sinking fund was to be formed, to be held and applied by the Chamberlain of London for the extinction of the Company's capital. The Act granted to the New River Company authorized the construction of works by which the Company would be enabled to obtain their own proportion of the stored water under the Staines Reservoirs Act of 1896. The Act obtained by the Southwark and Vauxhall Company was specially important, as authorizing them to take water from the Thames in excess of the prescribed 24½ million gallons per day. But the Company were required to introduce next session a Bill for powers to obtain land and construct within eight years such storage reservoirs and other works as may be necessary to enable them to fulfil their statutory obligations.

The Act of the past session was to be repealed by the passing of the Bill in 1898; and in no case was the Act of 1897 to remain in force after Sept. 1, 1899.

While provision is thus made for maintaining the sufficiency of the Metropolitan Water Supply, there is every guarantee that quality as well as quantity will be duly cared for. There is no doubt that the report to be presented to the Local Government Board by Sir Edward Frankland in respect to the supply for 1897 will contain testimony equally favourable to that given concerning the supply for 1896. Sir Edward's monthly reports afford abundant evidence as to the excellence of the supply; and the same is to be said of those by Sir W. Crookes and Professor Dewar, giving a record of daily examination. A paper read by Dr. Percy Frankland at the Society of Arts last May placed in a striking light the advantages of subsidence and sand filtration in the preparation of river water for the supply of towns. Some recent analyses of table waters, and notably of seltzer, have yielded bacteriological results which stand in extraordinary contrast to the minute proportion of microbes found in the London supply. A statement made by Mr. Walter Hunter, the Engineering Director of the Grand Junction Company, at the conference of the Institution of Civil Engineers held in the middle of the year, affords an instance of the liberal spirit in which the London Water Companies realize their responsibilities. He stated that his Company were spending £100,000 in improving their storage and filtration works—an expenditure which was in itself unprofitable, and would not add one sixpence to their revenue. The spirit which animates certain members of the County Council is shown by the way in which they ignore whatever is done to secure the excellence of the supply furnished by the Companies, and strain to excite prejudice in the opposite direction.

The Royal Commissioners appointed to inquire into the subject of the Metropolitan Water Supply have held three sittings, and have received evidence from one witness—Mr. H. L. Cripps, the Parliamentary Agent of the London County Council. A satisfactory announcement has been made by the Chairman, that the present Commission will not proceed to re-open questions which have been reported upon by the Commission presided over by Lord Balfour. Speaking generally, the new Commission will accept the findings of the previous body. Though this clears the way for further progress, it is expected that the labours of Lord Llandaff and his colleagues will prove to be of a protracted nature; the terms of reference having a wide scope. The evidence given by Mr. Cripps contained much of an historical nature, and certainly showed intimate acquaintance with the subject. But the questions put by Lord Llandaff frequently placed the witness in a difficulty, and tended to show that the soundness of the County Council policy was open to much doubt. After arguing that Parliament always intended that there should be competition among the Metropolitan Water Companies, Mr. Cripps signified that the only available plan now was to buy up the Companies and consolidate the undertakings. The idea of introducing a competing supply was abandoned, though another supply might be introduced after that which now existed was acquired by the Council. On the subject of the outer areas, Mr. Cripps failed to show how there could be concentration if several authorities were to take separate possession of the water supply outside the Metropolis. As for placing the Companies under a system of control, Mr. Cripps said the County Council objected to such an arrangement, as wanting in finality. The ideal entertained by Mr. Cripps was to let the Companies remain, and bring in a competing supply. But it would be "hard on the Companies," and he did not see how it could be done. Neither could the Council. On the whole, it does not seem as if Mr. Cripps's evidence is likely to carry much weight with the Commission.

Though the past year has not witnessed the introduction of any great scheme of water supply, there has been considerable activity in Parliament in the promotion of Water Bills connected with the Provinces. Whether the present system of sending Private Bills of this description before a Select Committee is the best that could be devised, was the subject of an interesting discussion at the annual meeting of the British Association of Water-Works Engineers last summer; the formation of Water Boards for the purpose of dealing with such measures being advocated. The subject was opened by the retiring President, Mr. D. M. F. Gaskin, who made reference to the contest between Nottingham and Newark in the prosecution of their Water Bills during the session of 1897. The result of eighteen days' discussion of the Bills in question, involving much expense, was that neither of the Corporations gained what they wanted; whereas if the Bills had been investigated by a Water Board composed of technically educated men, who, after receiving evidence, had viewed the districts, he felt certain that both Nottingham and Newark would have gained by it. Mr. W. Whitaker remarked that, in the case referred to, he considered the most important point was that of the protective area. We observe that the question will present itself in the case of the Mid-Kent Water Bill in the coming session; the Company desiring to prohibit the sinking of wells within their limits of supply. Among the projects carried through Parliament in the past session was one for the transfer of the Fylde Water-Works. A Joint Water Board is to be formed, consisting of representatives from the Councils of the borough of Blackpool and the urban districts of Fleetwood, Lytham, and St. Anne's-on-Sea. The construction of additional works was authorized at Eastbourne; and the Company's pumping-station at Holywell was sanctioned. Power was given to raise additional capital to the extent of £100,000. In sundry cases there was a transfer of a company's undertaking to the local authority, as at Harrogate, Nuneaton, North Shields, and Pwllheli. In other cases a local authority was authorized to purchase, as at Chichester, Deal, and Hunstanton. Some of the Acts extend the limits of supply, as at Belfast and at Leicester. In the latter instance, the extension comprehends eight parishes, and a sum of £100,000 is to be borrowed for water-works. The extension of works was authorized in several cases, as at Manchester, where the sum of £210,000 is to be raised, of which not more than £100,000 is for the supply of water for hydraulic power. Extensions of works were sanctioned at Nottingham and Newark; the Corporation in the former instance being authorized to borrow £300,000 for water-works purposes. A new reservoir, holding 335 million gallons, has lately been opened at Cardiff; and other extensions of the existing works are in progress, including filter-beds and a high-service reservoir. The gigantic works are in satisfactory progress by which Birmingham is to be supplied with water from the valleys of the Elan and the Claerwen, in Wales.

The disastrous outbreak of typhoid fever at Maidstone, and a similar visitation, though on a smaller scale, at King's Lynn, have directed increased attention to the importance of proper sanitary arrangements for the protection of the water supply. The value of analysis for the detection of impurities in water was demonstrated in the Maidstone case; the neglect of this safeguard having evidently left the town open to the fatal attack which ensued. At Lynn, the most remarkable fact was the supineness of the people, who resisted the attempts of the Local Authority to introduce a pure supply. There can be no excuse now for allowing the water supply of a town to be impregnated with anything in the nature of sewage. The danger can be readily detected, and the means of averting it are known. The greatest difficulty is where the ratepayers refuse to let the Local Authority incur the requisite expense for securing the health of the district. If people choose—as they did at Lynn—to drink dirty water, and declare that "no better can be," the case becomes desperate. An absurd attempt was made in the London County Council to turn the Maidstone epidemic to account as suggesting danger in connection with the water supply of the Metropolis. The conditions existing in the two cases are as opposite as can be conceived. Anything hurtful in the Metropolitan Water Supply would be detected in a day, or even in a few hours; and the probability of such an event is so remote as to verge on the impossible. The attempt to create a scare in London because of the epidemic in Maidstone has been very ably denounced in "The Times," and shows the outrageous extent to which a partisan policy can be carried. With respect to the treatment of sewage, the improvement in the state of the Thames in the neighbourhood of the main drainage outfalls has become so apparent as to excite much interest. The river through all its tidal course is immensely altered from what it was; and so salutary a change increases the regret that Mr. Dibdin, who deserves the credit of this result, has severed his connection with the County Council.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1403.)

BUSINESS on the Stock Exchange last week was a good deal better than might have been expected—really not so bad, all things considered. And it kept up pretty well to the end, despite the natural inclination to be closing down for the holidays. The tendency at first was rather flat, though some departments rallied later on. The general outlook of affairs both at home and abroad was not in favour of higher prices—the Engineers' war showing no promise of a satisfactory solution, and affairs in China giving rise to apprehension. The Money Market was very strong; there being an excellent demand for money, while discount rates point to firmness being probably durable. Business in Gas was not extensive. But the tone was very firm; and the tendency was in favour of higher prices all round. In Gaslights, the "A" was moderately active, and in good demand. From the opening, it showed a disposition to improve, and soon advanced the quotation a point, with transactions marked at 316 steadily every day. There would seem to have been some speculation lately in the chances of the Company's stock-splitting Bill going through the Parliamentary Committee—a result which would in all probability put the price up to a material extent. The secured issues were dull, and devoid of feature. Extreme quiet and absence of change were the only characteristics of South Metropolitan; and Commercials were not touched at all. The Suburban and Provincial division was equally devoid of interest, and not a quotation varied. The Continental Gas Companies, though transactions in them were extremely restricted, did at least show a move. Imperial Continental continues to progress in favour, and added another point to its gains of the previous week. Hardly anything at all was done among the undertakings located in the remoter parts of the earth; but Melbourne 4½ per cent. bonds gained a couple of points. Business in the Water Companies was at a very low ebb, as might be expected; but the tendency was all in the direction of better prices. The only changes were a further small advance in Southwark ordinary, and in the "D" shares, consequent upon the improvement in the rate of dividend.

The daily operations were few and unimportant, with the exception of those effected in Gaslight "A," which have been already sufficiently noticed above. It is therefore unnecessary to particularize them from day to day in the usual manner.

ELECTRIC LIGHTING IN 1897.

THE record of progress in electric lighting during the past year is rather of statistical than of technical interest. According to Mr. Garcke's "Manual of Electrical Undertakings" for 1897, the amount of subscribed capital in shares and debentures of electricity supply companies up to the present time is £6,648,000; and the loans authorized to be raised by Municipalities for the same purpose amount to £3,509,000. It is not stated how much of this capital is active, or how much has to all intents and purposes departed into the *ewigkeit*, with Hans Breitmann's lager beer. It is further stated that at the close of the last financial year, 283 Electric Lighting Orders were in force, and that the applications for Orders now pending number 99. Yet another figure—the number of lamps, reduced to the equivalent of 8-candle power, connected to the mains of the various electric lighting undertakings of the United Kingdom is taken at 3 millions; a good round figure indeed. Upon all this the partisans of electric lighting may be congratulated. It is to be recorded, moreover, that quite a respectable number of electric lighting companies are quoted in the London Stock and Share Market as dividend-paying concerns. Most of these, it is true, are Metropolitan investments, the number of blanks in place of "present price" increasing noticeably as soon as ever London, Birmingham, Newcastle, and perhaps half-a-dozen other big concerns, are left behind. The shares of electrical manufacturing companies are not regarded as good property; few of those doing electrical work only being quoted at or above par. When it is remembered that not many years ago rights to manufacture and deal in certain electrical specialities in particular counties or districts were priced at fabulous sums, the condition of the trade to-day seems to constitute a homily on the folly of trusting to electrical patents.

From the technical point of view, electric lighting last year presents few novel features. Indeed, when it is borne in mind that the oldest electric lighting companies in London, and the most successful, are doing their work now pretty much as they did when they first began business, it is clear that there is not much to be said about technical progress. Of course, with every year defects of detail are discovered and corrected, and practical economies discovered and followed up. But commercial electricity supply from central stations is still what Siemens and Hopkinson and Kennedy made it at the start. And the lamps are the same as those in use the year before last, and the year before that again. This much, however, has been gained—the generation and supply of electricity for lighting and power purposes is beginning to be understood, even by members of local authorities, to be merely a branch of mechanical engineering. The popular delusion that there is something mysterious about it, which only some Great Panjandrum could be supposed capable of bringing into the service of any particular district, has almost disappeared. True, the electrical tout is still with us, and has not quite lost all chance of persuading people who ought to know better that, where electricity is concerned, it is possible to get something out of nothing. It takes a long time for knowledge to penetrate to all parts of the country, even in these times.

The great point to be remembered is that the end of the year leaves electric lighting neither materially better nor worse than it was, in the technical sense, at its beginning. The electric light is still exhibited in the two forms of the undesirably powerful arc lamp and the comparatively expensive incandescent lamp. All manner of "dodges" have been tried to cure this patent disadvantage of the latter form of the light. Mixing up the service with tramway working or house-bin refuse destruction is one kind of nostrum recommended for this purpose by "the faculty." Another is the administrative device known as the Brighton system of differential charges for current according to the time of daily use of the lamps. These expedients have not been found to possess universal validity.

Great things were hoped of the new high-voltage lamps introduced during the last year or two; and some important electric lighting undertakings have adopted them with fairly satisfactory results. The most enterprising policy in connection with this development was exhibited by the Bradford Corporation, who supply consumers with a reasonable number of new lamps gratis. A movement was initiated for the "free wiring" of houses for electric lighting, in relation to an adaptation of prepayment meters to electricity supply; but information is lacking as to the extent of the business done in this way. The year did not witness the production of a really cheap and reliable consumers' electricity meter. There was a recrudescence of road-carriage traction by electrical power stored in accumulators, with what permanent success remains to be proved. The introduction of electrical traction for tramway working in different parts of the United Kingdom made a certain amount of headway, but not without some attendant results indicating that the system still has its risks. One noteworthy feature of the times is the taking of steps by several gas companies to obtain statutory powers for supplying electric lighting in districts which would otherwise be unable to obtain the luxury. Another is the proposal actually awaiting the consideration of Parliament to create electrical power generating stations on a large scale in the coal-fields, and even nearer home, whence the distribution would be effected to a distance, as in the Niagara power scheme.

To conclude this necessarily brief survey of the state of electric lighting in the year 1897, the fact of the supply having been interrupted over considerable areas of the Metropolis on more than one occasion during the present month, shows that some of the old weakness—unreliability—still clings to this method of artificial lighting.

A Safety Ladder Grip.—Everybody using ladders is aware of their liability to slip when resting upon ordinary paving-stones. A simple method of preventing this has been devised by Messrs. Chandler and Carley, and is illustrated in the current number of the "Builder." It consists of a slab of wood with two strips of corrugated lead fixed to the under side, which make it safe from slipping, and with two cavities into which the base of the ladder is inserted, and chains which are passed round the standards of the ladder and screwed up tight. The fittings are of galvanized iron. The bases are made in two sizes, 4 feet and 6 feet long.

Natural Gas at Waldron.—The discovery of a large supply of natural gas occurred accidentally while boring for water in the parish of Waldron, Sussex; and Mr. Charles Dawson has sent a letter on the subject to "Nature." The gas, the supply of which is controlled by a jet, has shown no diminution in pressure during fifteen months; and it is thought that there is an ample supply for the lighting of a town. Samples of the gas have been submitted to the County Analyst for East Sussex (Mr. S. A. Woodhead); and though he has not yet completed his analysis, he thinks the gas is probably derived from petroleum. The gas may come from beds of lignite, or from the petroleum shales of the Purbeck beds.

The Testing of Explosives for Use in Coal Mines.—The report of the Departmental Committee appointed by the Home Secretary to inquire into the testing of explosives for use in coal mines has just been issued. It is recommended therein that explosives should be tested in a highly explosive mixture of coal gas and air only; and the Committee feel confident that any one which shows itself superior in this mixture would exhibit the same increase in safety in the presence of a coal dust mixture. Taking into account the general results of the experiments, the Committee have drawn up a test, and recommend that it should be applied to all explosives which are submitted for inclusion in the permitted list. Details of the test suggested appear in an appendix.

AMERICAN VIEWS OF STREET LIGHTING SYSTEMS.

An account has been given in these columns of the American Mayors' Convention; and it has been noted that at the same time and place the Second Annual Convention of the National Street Lighting Association of the United States was held. It is a most remarkable circumstance that the latter convention was kept going for the greater part of three whole days. English gas engineers and members of local self-governing bodies are interested in the subject of street lighting; but we shrewdly suspect that if anybody were to propose a semi-official meeting, to last three days, with the sole business of discussing this subject in all its bearings, the idea would not be warmly received. As it was, the American gathering was neither large nor conspicuously representative; but it was the means of evoking several businesslike papers and discussions.

The first noteworthy communication brought before the Convention was by Mr. A. R. Foote, who dealt with the subject of "Art in Street Lighting." The author truly observed that the consideration of the artistic aspect of street lighting is the last to be regarded by lighting authorities. "First, the object was to light the streets simply for the sake of the utility, or permitting people to move about after dark with safety and comfort. Next came the economical consideration of the best means of furnishing light for street use in its broadest sense, covering not only the centres of the city, but the residence streets and suburbs. Finally, we have the artistic effects in street lighting which give pleasure by their beauty." It is to be gathered from a subsequent statement that the main street of the city of Columbus, Ohio, is spanned by lighted arches—a showy style of street lighting, but capable of very limited application. The chief suggestion in Mr. Foote's paper, which was very short, was that every city should place its street lighting under the control of a thoroughly competent superintendent, who should make a continual study of the subject as a whole. "For practical as well as artistic considerations, street lighting as an art should become a profession, with its individual National Association of its promotion." The English of this recommendation is a trifle clumsy; but that is nothing in an American convention. It is more to the purpose to note that nobody had anything at all to say about Mr. Foote's counsel of perfection.

It is perhaps easier to understand the reason why the subject of street lighting arouses so much discussion in the United States when one is made acquainted with the chaotic state of this service throughout the country. Owing to the absence of anything like system in respect of the work of the highway authorities, no two towns pay the same for, or receive similar, public lighting service. Philadelphia, for example, pays as much as $146 per annum for the same arc lamps that light the little city of Wilkesbarre at an annual charge of $80. It is to be observed, by the way, that the standard arc lamp costs ordinarily from $70 or £14, to $140 or £28, per annum. It is not believed that the contracts taken at the former figure pay. English readers may be surprised to learn that $1 per ton of 2000 lbs. is considered a fair price for coal to be used as fuel for electric lighting stations in a number of States. With fuel so cheap, and overhead distribution of the crudest kind, it is no wonder that electric arc lighting for the public streets has become so general in the United States. The question that seems to agitate the American Municipal mind in this regard is whether it is preferable on all counts for town authorities to do their own street lighting by arc lamps, or put the work out to contract. Rarely is there any question of combining a private business with the street lighting service; and we are bound to say that gas lighting did not seem to interest the Convention at all. A typical witness for the municipalizing of the street lighting service was Mr. Hunter, the Superintendent of the Bureau of Public Lighting for the City of Allegheny. Asked by the President: "Do you believe, with your knowledge and experience of seven years—would you, upon that as a basis, recommend any city, no matter what its size, to have its own municipal plant?" The reply was: "That question would be determined by the rate paid by that city for its light. . . . If a city is not getting its light with 2000-candle power lamps at a cost, or nearly so, of $80 (£16 13s. 4d.) per annum, based upon coal at $1 per ton, it is about time for them to commence thinking about doing their own work." This estimate is for 4000 hours' lighting, and is made on the assumption that every lamp represents the burning of 10 tons of coal per annum. This is a large allowance; but it is taken as a round figure in order to exhibit the effect of the cost of coal on the cost of the light. Thus, any increase in the cost of coal beyond $1 per ton would be added to the stated cost ($80) of an arc lamp for a year.

These data are reproduced here in order that our readers may understand precisely the contemporary condition of street lighting by electric arc lamps in the United States, concerning which some rather wild statements are occasionally published. It should be remarked that Mr. Forrest E. Barker, one of the Gas Commissioners for Massachusetts, who attended the Convention, traversed much that had been advanced by Mr. Hunter. He did not admit, for one thing, that the cost of fuel is the only, or the main, factor, in determining the cost of arc lighting on a large scale. He suggested that "quality of service" is a very important element in the case; and he drew attention to the fact that there are no systematic tests of the candle power or other points in an electric lighting service. The amount of business done is also a vital consideration. Mr. Barker concluded some impressive comments by confessing that he had often wished, in the course of his official experience, for some simple rule upon which the price of arc lighting could be determined, but had not been able to find any.

Questioned on the point of how the Massachusetts Gas Companies within his jurisdiction bear the test of "quality of service," Mr. Barker testified that the gas supply is "very regular." All the Massachusetts Gas Companies are subjected to periodical testing at the hands of a State officer, and there is a fine of $100 for any default in respect of illuminating power or purity. "That is true of gas companies; but there is no such supervision of the electric light companies . . . The municipality which undertakes that and makes it in any degree respectable and efficient is the exception rather than the rule." This being so, it is evident that the "quality of service" of a street arc lighting plant, municipal or other, must be an unknown quantity. With regard to the cost, it appears probable that if the substantial and comparatively unobjectionable methods of distribution and application required in England were carried out in the States, the cost of the light in both countries would be about the same —£28 to £30 per annum, after allowing for depreciation.

A striking little interlude at the convention was the appearance of the Mayor of Niagara Falls City, who gave a popular description of the power installations at the Falls, which transmit energy as far as Buffalo, about 24 miles. After the Mayor had duly expatiated upon the facts, a member quietly asked if it was known what was the loss in transmission between the power station at the Falls and the receiving station in Buffalo. The reply was: "Well, that is an unknown quantity. The engineers do not say. We cannot find out. I have understood it is about 30 per cent. It is so much they are not pleased with it." This was one of the most poignant criticisms of the system that has yet appeared in print.

Before the convention broke up there was quite an animated discussion of the fundamental question whether a permanent association of street lighting officials could maintain its independent existence. Eventually it was decided to make the attempt; a guarantee of permanence being discovered in the constant demand for information arising from all parts of the country. It is, in effect, a case of an organization designed with special regard to the "circular of inquiry," and having the intention of converting this common nuisance into a bond of union. The idea is intelligible; but whether the basis of the proposed organization will stand the strain of every-day life, is another matter. There is a good deal of human nature in the desire to have a bureau to which application for information can be hopefully made at any time. There is more human nature in the tendency exhibited by every specialist to think his own subject of paramount importance. Accordingly, the public lighting officials of a number of United States towns are not to be ridiculed for holding that the things they would like to possess as common doctrine are important and numerous enough to need a Society, with a constitution and officers, to look after. It is complained, with obvious justice, that when American municipalities need information upon such a subject as public lighting practice in other towns, it is extremely difficult to obtain it. There is no other resource open to the inquirer than the circular of inquiry; and we all know what happens to this kind of missive. We are not sure that our British professional and technical societies could not so far take a leaf out of the book of the Street Lighting Convention as to making the circular of inquiry a bond of union among their members. Only there would have to be an understanding that all proposed inquiries should be forwarded in the first place to the Secretary of the Society, who should submit the same to a Sub-Committee charged with the duty of passing the form of the circular. If the circular were judged favourably, it would be distributed among the members of the Society, who would be pledged to treat it respectfully, and do their best to supply the information desired. How would this answer?

Another bit of human nature that came out in the course of the discussion of this matter was the reluctance of local authorities to be altogether guided by professional experts. To do them justice, members of local authorities everywhere wish to know how they can best exercise the final discretion, which is theirs, as to how their town shall be lighted. They can ask an expert. But if the expert is a gas engineer, he will naturally recommend gas; and if he is an electrician, it will equally be a case of "there is nothing like leather." The wiser municipalities everywhere are coming to see that in regard to such a matter their advisers should be constrained to supply them with data, not opinions, and that the question of expediency must remain for themselves. If the Association of Public Lighting can educate municipal opinion in the United States to a sounder appreciation of the economical data upon which public policy in this regard must rest, it will justify its founders and supporters.

Gas Tramways in Holland.—According to "Het Gas," horse traction has been superseded by gas traction on the line from Dokkum to Veenwouden, in Friesland; and plans have been prepared for a gas tramway connecting the towns of Oss, Grave, and Cuyk, in North Brabant.

PERSONAL.

Mr. F. W. Johnson, the Deputy Manager of the Southport Corporation Gas-Works, has been appointed to succeed Mr. R. Merrell in the managership of the Mossley Corporation Gas-Works. There were 48 applicants for the position.

Mr. B. G. Venner, who for 43 years has been Manager of the Eton Gas-Works, has retired on a substantial pension from the Gas Company. Mr. Venner is 76 years of age, and is in indifferent health. One of his two sons has been in the service of the Company for about twenty years; and the other has been with the Windsor Gas Company for a similar period.

OBITUARY.

The death is announced of Mr. Bailey Blackburn, the Chairman of the Shipley Gas Company. Ill-health had confined Mr. Blackburn to his house for some months; but he had reached the great age of 85 years.

The death is announced, in his 71st year, of Mr. John Stone-Wigg, J.P., of Estcourt, Tunbridge Wells. Deceased was one of the Directors of the Chelsea Water Company, and was also interested in the local gas and water undertakings. He was a Deputy-Lieutenant for Kent, and was the first Mayor of Tunbridge Wells.

NOTES.

Chemical v. Bacteriological Examination of Contaminated Water.

At the Paris Academy of Sciences on the 6th inst., M. Duclaux dealt with the above subject. He showed that a comparatively simple chemical analysis suffices to distinguish between polluted and unpolluted wells, provided the composition of the water of the district in a pure state is known. He looked upon bacteriological examination as less trustworthy than chemical.

Additions to Portland Cement.

The contention that good Portland cement cannot be improved by additions of foreign matter, has been supported by the recommendations of the Association of German Portland Cement Makers, and quite recently of the London Chamber of Commerce (*ante*, p. 999). The work of Michaelis and of Erdmenger is also corroborative; but Lundteigen, in the "Thonindustrie Zeitung," now states that the position towards addition of foreign matter taken up by the German Cement Makers' Association puts bad and good admixtures in one category. By his own researches, he claims to have proved that a volcanic ash found in great quantities in Colorado (Nebraska) and elsewhere, improves cement to which it is added.

The Transparency of Flame.

The "Journal für Praktische Chemie" records experiments by Herr M. Teclu on the presence of finely-divided carbon in an ordinary luminous coal-gas flame. Hirn had been unable to prove the presence of carbon in the flame; but in order to adhere to Davy's theory of flame, he propounded the hypothesis that the carbon particles at the high temperature of the flame were transparent and diathermanous. Teclu set up twelve flat flames at distances of 3 centimetres from one another, and flat side towards flat side; and by means of an electric light at one end of the series, he threw a shadow of the column of flames on a screen, and took a photograph of the shadow. A distinct shadow, which could not be caused by gases or vapours, was observed under these circumstances, and was undoubtedly due to solid matter in the flame; and such matter must necessarily have been finely-divided carbon. Hirn's assumption of the transparency of the carbon particles in the flame, is refuted by this experiment, which undoubtedly proves on optical grounds the presence in luminous hydrocarbon flames of finely-divided, incandescent opaque carbon.

A Rapid System of Sounding.

In the course of a series of comprehensive investigations and surveys which have been carried out by Mr. G. S. Williams, the City Water Engineer of Detroit (Mich.), with the view of determining the possibilities of future improved water supply, or the location of intake wells in the river, a very rapid system of taking soundings was employed, of which a few particulars have been given in the "Engineering Record." Contours were run by means of soundings taken 100 feet apart. For convenience, these were made in the winter, when four men were able to make fifty soundings an hour in from 20 to 30 feet of water. They were provided with a wheel of about 3 feet in diameter, so that its circumference had a length of exactly 10 feet, divided into 3-inch units. On the wheel was wound fine brass wire, to which the lead was attached. The whole was mounted on runners, which two men pushed over the ice from hole to hole, which had been previously cut. There were no graduations on the wire; but the position of the wheel at the beginning and end of the sounding was noted by a recorder, who also counted the revolutions, which were equivalent to 10 feet each and never exceeded three, so that mistakes were practically impossible, and the record was made with great rapidity. One man kept the book, another operated the wheel, and two more moved it from place to place.

Researches on Lime Burning.

Some researches by Herr A. Herzfeld, of which a *resumé* is given in the "Chemiker Zeitung," afford valuable hints on the conditions favourable for the production of quicklime. Pure calcium carbonate may be burnt to lime in 45 minutes, by the agency of superheated steam, at a temperature of only 1450° Fahr.; whereas without the aid of steam, a temperature about 360° higher is required. With impure limestones, the employment of steam is worse than useless. Organic substances—such as coke, sawdust, &c.—though commonly supposed by practical lime-burners to cause the calcium carbonate with which they are mixed to burn to lime at a low temperature, in reality do not affect the temperature of the burning. Exhaustive tests on a large number of mixtures of pure calcium carbonate and common impurities of limestone, threw light on the causes of overburning and the production of dead lime. They are incidentally illustrative of the fundamental difficulties attending the reburning of spent gas lime. Silica is the *bête noir* of the lime-burner, especially when in a finely-divided condition, instead of in coarse grains of quartz. About 6·27 per cent. of silica suffices, in two hours, to give a dead-burnt lime. Sulphur is invariably injurious, as it leads to the formation of gypsum, which is detrimental in the slaking of the lime. Tests on 68 limestones actually used for burning, showed that a temperature of 1650° Fahr. was too low, but that about 1885° Fahr. was sufficiently high to burn all the samples to lime.

The Economical Generation of Steam.

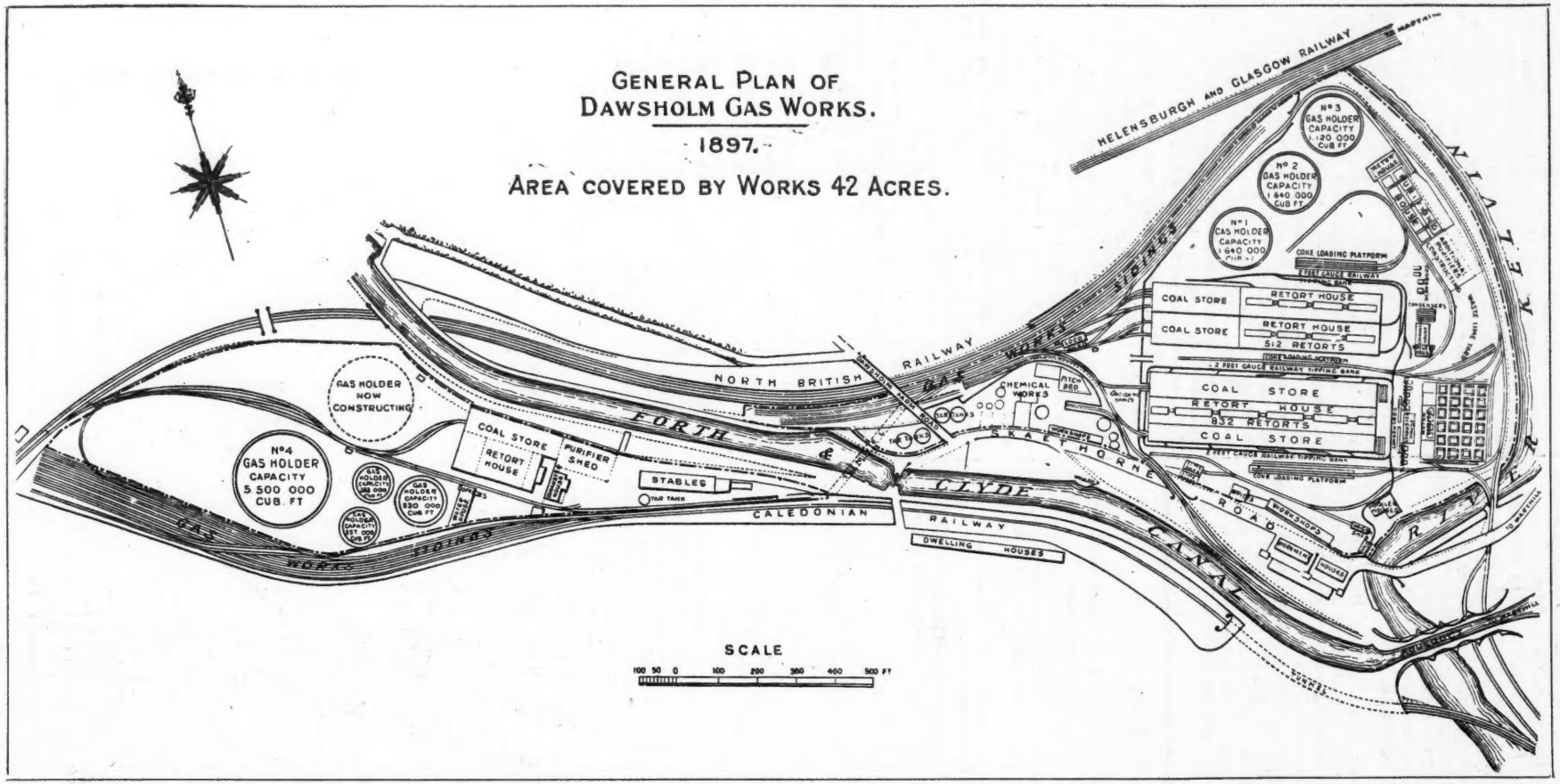
The above subject was recently dealt with in a lecture given by Mr. W. Price Abell, Wh.Sc., Assoc.M.Inst.C.E., at the University College, Nottingham, under the auspices of the National Association of Colliery Engineers and Managers. The author remarked that it was well to recognize that steam was a medium for carrying heat just as wire was for carrying electricity; and this increased heat had invariably meant increased economy. After Watt's time, engineers rested somewhat on their oars, as they considered that his condenser had overcome waste from cylinder condensation. As a matter of fact, all along the line, he who used higher pressure and higher temperatures invariably received most value for the money he paid for his fuel. This had developed until to-day there was to be found a very marked tendency for hotter steam. Why was this? Because with hot dry steam they reduced cylinder condensation. Latterly it had become a practice to raise steam to a high pressure in water-tube boilers, and then to wire-draw it down to the engines. It was absolutely necessary to economy that steam should be supplied to an engine, not in its saturated state, but more or less dry; and wire-drawing to a great extent met this by maintaining the cylinder at a more equal temperature. As a matter of fact, comparatively dry steam having a superheat of 60° to 100° Fahr. was effecting economies of 15 per cent. It was a mistake to think high fuel consumption meant only a coal bill. It meant high labour and production costs; excessive capital in large engines and boilers for work done. Low steam pressure invariably implied lagging wheels; and these implied lagging hands and a high production cost through the whole works. The lecturer had stated in a paper read before the Institution of Civil Engineers that, by intelligent attention to steam and fuel economies in British Guiana, a saving of upwards of £100,000 per annum in fuel had been effected.

The Design of Structures with Regard to Maintenance.

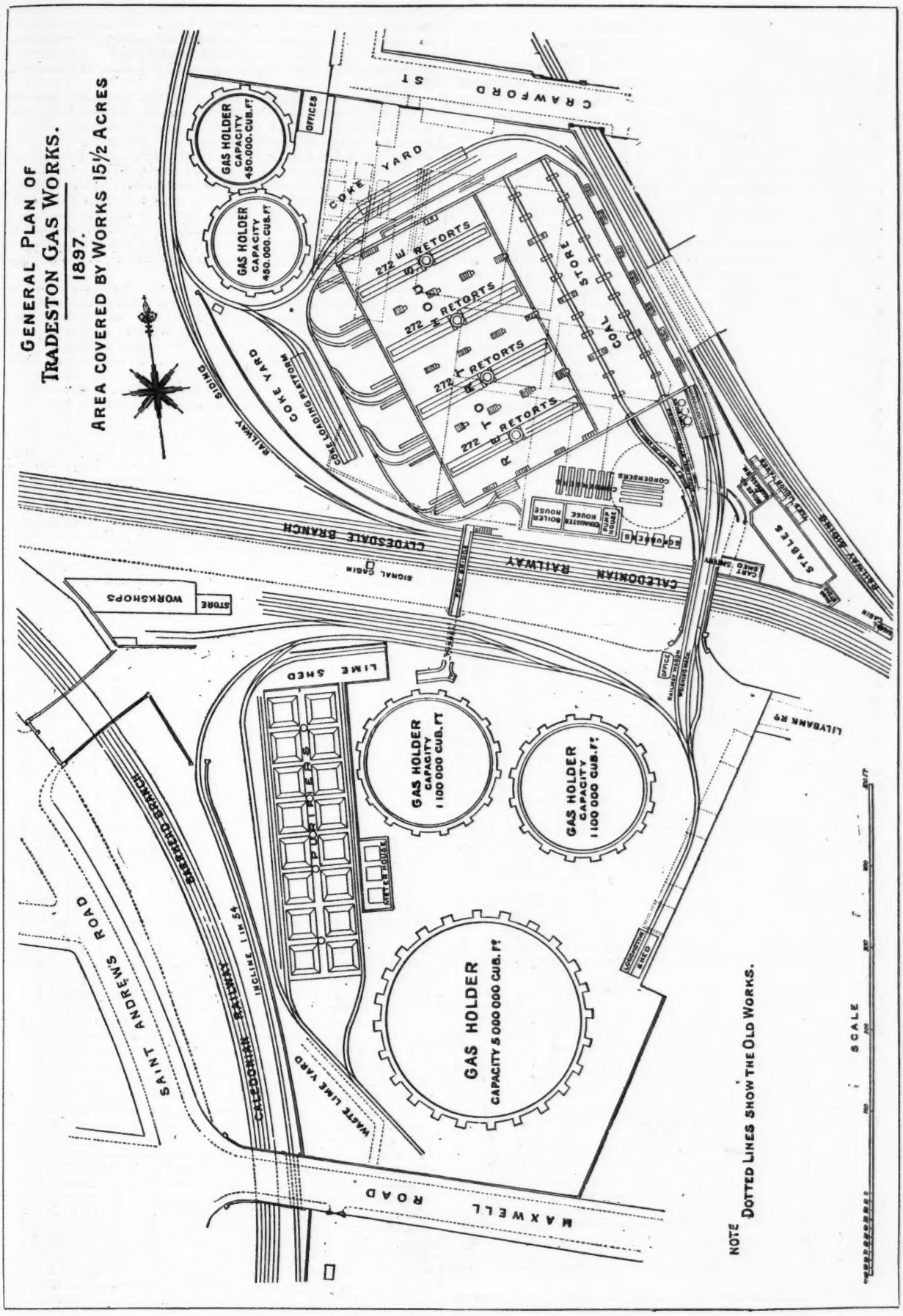
Mr. W. B. Worthington, the Chief Engineer of the Lancashire and Yorkshire Railway, recently delivered his Inaugural Address as President of the Manchester Association of Engineering Students. Its principal subject was the important one of design in relation to the maintenance of engineering structures. Mr. Worthington dealt with the question as it appears in connection with the designing of a structure; and he laid it down that the engineer must in the first place comply with three conditions: First, the structure must be strong enough to fulfil the purpose for which it was intended; secondly, it must be capable of being maintained in good order by the class of labour and with the material and appliances available, at a reasonable expense; thirdly, it must be constructed at the minimum cost, consistently with fulfilling the first and second conditions, and any other special ones that might be imposed. Other conditions might, of course, be added, such as the æsthetic treatment of engineering work. The text of the address was really to be found in the second condition. This relates to an order of ideas that should always be paramount with designers of work; but they are often neglected. Disregard of the condition proceeds from two main causes—ignorance of maintenance requirements, and desire to save first cost. The subject of construction is naturally more fascinating to young engineers than the humdrum care of works actually erected. Yet without experience of the latter, engineers are apt to go wrong in the former. To correct this tendency, Mr. Worthington advised the student to devote his period of training to acquiring some knowledge of maintenance, so that he might have at first hand a good store of those out-of-the-way bits of knowledge, not usually to be found in books, which will eventually guide him in his designs. Good designing consists in providing for many apparently trivial matters; and the engineer whose experience of maintenance enables him to meet them has one of the main qualifications of a good designer.

THE DAWSHOLM AND TRADESTON GAS-WORKS OF THE GLASGOW CORPORATION.

W. FOULIS, M.Inst.C.E., ENGINEER.



On the occasion of the recent official visit of the Gas Committee of the Glasgow Corporation to the Dawsholm and Tradeston stations (an account of which appeared in the last number of the "Journal"), visitors were presented with a pamphlet containing ground plans of the two works, as reproduced, accompanied by the following particulars: "The area of ground occupied by the gas-works belonging to the Corporation extends to 78 acres. There are about 7½ miles of railway sidings within the works, besides a considerable length of narrow-gauge lines. To work the traffic over these sidings and narrow-gauge lines, there are eight large and nineteen small locomotives. About 2900 tons of coal are received into, and about 1000 tons of coke, ashes, waste lime, &c., sent out of, the works every 24 hours in mid-winter. The following figures show the increase in gas manufactured per annum during the last forty years: Make in 1857, 697,378,000 cubic feet; in 1867, 1,119,842,000 cubic feet; in 1877, 1,817,163,000 cubic feet; in 1887, 2,596,470,000 cubic feet; in 1897, 5,167,118,000 cubic feet. The price per 1000 cubic feet in 1857 was 4s. 7d.; in 1867 and 1877, 4s. 2d.; in 1887, 3s.; and in 1897, 2s. 2d. The quantity of coal carbonized during the last financial year amounted to 555,781 tons—an increase of 39,400 tons over that used in the previous years. During the current year there will be a further increase of at least an equal amount. The gasholders in connection with the works can contain 23,494,000 cubic feet. An additional holder, having a capacity equal to 5,000,000 cubic feet, is in course of construction at Dawsholm."


GENERAL PLAN OF
TRADESTON GAS WORKS.
1897.
AREA COVERED BY WORKS 15½ ACRES
GAS HOLDER CAPACITY 450,000 CUB. FT.
GAS HOLDER CAPACITY 450,000 CUB. FT.
OFFICES
COKE YARD
ST CRAWFORD
272 RETORTS
272 RETORTS
272 RETORTS
272 RETORTS
STORE
COAL
COKE YARD
RAILWAY
SIDING
COKE LOADING PLATFORM
CONDENSERS
CONDENSER HOUSE
BOILER HOUSE
ENGINE HOUSE
STABLES
CLYDESDALE BRANCH
CALEDONIAN RAILWAY
SIGNAL CABIN
STORE
WORKSHOPS
LIME SHED
PURIFIERS
GAS HOLDER CAPACITY 1 100 000 CUB. FT.
GAS HOLDER CAPACITY 1 100 000 CUB. FT.
GAS HOLDER CAPACITY 5 000 000 CUB. FT.
SAINT ANDREW'S ROAD
CALEDONIAN RAILWAY INCLINE 1 IN 54
CLYDESDALE BRANCH
WASTE LIME YARD
MAXWELL ROAD
LLYBANN RD
NOTE DOTTED LINES SHOW THE OLD WORKS.
SCALE

TECHNICAL RECORD.

THE ILLUMINATION OF ENCLOSED SPACE.

By Dr. W. H. BIRCHMORE.

[Prepared for the "American Gaslight Journal."]

In a previous issue* I described in detail the illumination of a certain apartment of two rooms, stated as fully as seemed needful the defects found by examination, and gave the only clue which seemed to promise any definite results—the efficiency of the illuminating power of sunlight at various angles. In the description of the rooms I omitted to mention the fact that they had no architectural significancy whatever, and that the doorway of communication between them was simply a hole in a wall bounded by a frame. The doors themselves were wanting.

Having made the studies as described in the previous contribution, it was determined to abolish the pendant lights, and give the rooms, to an extent at least, an artistic physiognomy. The values of the new lights to take the place of the pendants, and their locations, were determined before the other changes in the rooms were planned. The first change made was to run an ornate cornice around the entire range of the walls, and to make of the square hole a more artistic opening. The bottom of this cornice (its lower edge) was made level with the top of the door opening into the hall, 7 ft. 6 in. above the floor; the cornice was 1½ feet high, and the same in offset. The doorposts were enlarged in proportion. The communicating doorway was changed as follows: Where the partition came against the wall, a finish pillar, like the doorpost, was placed, as if to support the cornice. Two pillars were set up, 10 feet centres, to form the door proper; and an arch was sprung between them, the keystone of which touched the ceiling. From these pillars to the finish posts and cornice were sprung two lesser arches; the space above them being filled by a plaster finish piece. The space above the cornice was finished as a mezzanine, in panels parted by finish posts. The panels contained decorative pieces in plaster. The height of this mezzanine was 3½ feet to the ceiling. The change in the number of the lights was not unimportant, though insignificant compared with the change in position and the gain in efficiency.

In the front room between the two windows were placed two mantles, and on the sides six others, three on either side, dividing the wall into two panels of 10 feet each, and the half panels. There were in all eight lights instead of five—an increase of three; and in each case the light was in the top of a finish post. In the rear room substantially the same change was made. Two lights were placed between the rear windows, answering to those at the front, and on either side two lights; making one 10-foot panel and two half panels. There were in all six lights in place of four. The paired lights between the windows were 2 feet centre to centre, and in all cases the light had a definite function in the architectural design. The total increase in the number of mantles was five—three in the front and two in the rear room.

Assuming the actual rated candle power to have been the same as the normal—40 candles to each mantle—there was 320-candle power in the front room and 240-candle power in the rear room—560-candle power in all, as against 360-candle power before the change was made. This represents 0·56-candle power for each square foot of floor space, or 0·32-candle power for each square foot of wall surface.

It is not quite fair to reckon in this way to the full height of the room, for a reason which will appear later; and if the height of the top of the cornice be taken as the superior plane, the results will be better adapted for comparison. Allowing for this, the lights were of 0·45-candle power for each square foot of the wall.

Up to this point the work had been purely the correction of a faulty design—giving the room a more interesting appearance, and assigning a suitable place in the details of the architecture for the fixtures to hold the mantle lights. We had determined that the lights should be placed on the sides, and where. Now we had remaining the harder part of the task—to give to the new fixtures their proper values, artistic and radiant.

Judging from information obtained by experiments made for the purpose, I determined not to use shades, but to let all the light radiating from the front half of the mantel travel in its unchecked way into the room, and to guide the other half by reflection into the path of my own choice. It was much more complex a task than I had imagined; but by repeated failure, I learned to direct the light into a path somewhere near right.

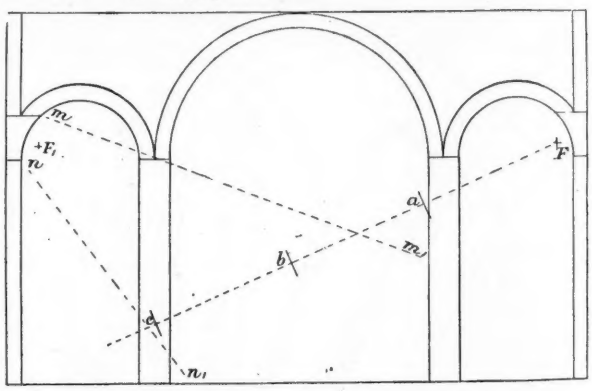
The fixture was so placed that the axis of the chimney came 15 inches from the wall, or 3 inches within the cornice line. This threw the mezzanine directly behind and above it into full shadow, causing the illumination of this part of the wall above the cornice to be made entirely by the lights from the opposite side of the room; thus lighting the ceiling much less than the floor of the room.

The reflectors were, at the first trial, parts of spheres figured to bring the caustic surfaces into the axis of the room. This did the work intended; but experiment showed that artistically it was a complete *fiasco*, for whenever the eye encountered the caustic it saw an inverted image of the light. I then tried part of a parabola; placing the parameter at an angle to the horizon. This did not give any images; but the caustic surfaces were insufficient, so I split the difference, and used a hyperbola as the plane figure to generate the reflecting surface, by revolution—setting the transverse axis at the desired angle. This gave a larger caustic surface than the spherical reflector, and made no images.

Having determined the osculating surface, it was next in order to break it into facets. For convenience of working, these were made twelve in number; and, starting with a radius of 3 inches, reached zero at the axis of the chimney. Of course, the surface was perforated to let this pass. Moulds were made from a clay model, and copper was planished to fit, nickel plated and burnished. From the method of working, the surface was not perfect, which added to the merit—that is, though the nickel made an almost ideal reflecting surface, the copper beneath it was not anywhere a "true surface." This produced certain beautiful phenomena of iridescence, probably from interference phenomena, and added variety which could never have been obtained by design.

When the reflectors were in place, and the mantles in full working order, the suggestion was a shell behind the mantle, as an ornamental detail, not a reflector at all. So much for the device employed to accomplish the purpose. It will be seen from the description that one-half of the radiation went out into space uncontrolled—that is, all the light which would naturally fall on any surface in the room from lights thus placed fell there. At the same time the other half of the radiation, or rather about 90 per cent. of this half, was distributed over a space chosen in advance.

This space had a vertical angle of 30°, and a horizon of not quite 120°; and within it the amount of useful light was rather more than was hoped for. Taking the horizon of the cornice, it is evident that the space below received from the front of the mantle one-fourth of all the radiated light. The balance of the radiation from the front of the mantle was sent partly upward and partly across the room to the wall above the cornice—the mezzanine finish previously described. The rest of the light was diffused over the space of the room as it were in a million small beams, at all sorts of angles of radiation and crossing, so that it appeared as homogeneous as any radiated light can do—in fact, almost as daylight does.



To understand the law of this radiation, the study of the diagram is suggested. Let it represent the conditions in the plane of the light next in front of the three arches connecting the two parts of the room. Let F and F_1 be the centres of radiation of the two Welsbach mantles. Let F, a, b, c be any radiation line of the light of F; $m\,m_1$ and $n\,n_1$ are approximately the bounding rays of the light turned back by the reflector. From the arrangements made, as has been stated, the hemisphere of radiation in front of F, for instance, radiates unmodified; the amounts of light falling on the plane a, b, and c being governed only by the law of inverse squares, so far as F is concerned. It is obvious that any light which may reach these planes from the direct radiation will be modified by two laws—that of the inverse squares and that of the sines of the angles with the normal to the ray. It is also manifest that every plane which is parallel to the axis of the room will receive more or less light from every other light on the same side; and a very little calculation will show that, so far as the direct radiation is concerned, the part of the light which is controlled by the laws of the sines increases a little faster than the amount from any one centre is diminished by the law of the inverse squares. Therefore the plane a, in moving from a to c, with respect to F, may be said to receive light from the various other mantles on the same side, as follows: (1) An amount from F, radiated directly, which diminishes by the law of inverse squares alone. (2) An amount from all the other lights than F which diminishes according to the law of inverse squares, but at the same time increases with the cosine of the angle of incidence, or with the sine to the normal to the plane.

At a very great distance, the lights being so close to each other, the difference in incidence angle would not be noticed;

* See *ante*, p. 1341.

but at the distance equal to that between the centres of illumination, it plays a very important part. For this reason the amount of light received from any one source on the same side between *b* and *c* is so little different from that received from any other one near it, that the shadows of the first order may be said to be non-existent—that is, the condition exists which we find out of doors on an ordinarily bright day. If we do not go directly into the sunlight, we find no shadow.

The reflector beam was made to follow a somewhat different law. The rate of diffusion was enforced in all planes, and in no two was it alike. Considered with respect to the plane passed, as in the diagram, the entire reflected half of the radiation was delivered in one-sixth the angular space in which it started. Had the mirror been part of a circle of revolution instead of a hyperbola, the reflected beam would have been a cone containing, more or less, nearly six times as much light as the direct beam. For convenience we might call the reflected light the indirect beam; but such indirect beam would have been sharply conical, and the edges of the caustic surfaces would have been rather too well defined. This has already been referred to. By using the hyperbola, however, the mirrors were rendered in a way astigmatic; and the rate of diffusion of the indirect beam in a plane parallel to $m\ m_1$, but having its axis in the plane of the wall, was as much greater in its angular value as the square of $m\ m_1$ was greater than $n\ n_1$. In other words, if the linear relation between $n\ n_1$ and $m\ m_1$ was as 2 : 3, the diffusion, had the conical form of ray pencil been used, would be as 4 : 9; and nine light-units would fall on *n* for every four falling at *m*. To avoid this, the reflector was so spread out that in a plane perpendicular to the paper in the line $n\ n_1$ these values would be reversed; and, consequently, each lamp (mantle) yielded the same amount of light to a square foot from its indirect ray at *m* as it did at *n*. Of course, this adjustment of the values held good only at these two points; but it was near enough to serve the purpose everywhere. From this it follows that the overlapping of the indirect pencils must have been even more efficient in the equalizing of the illumination than the same artifice with respect to the direct pencils; and so the after inquiry into results showed.

Considered as a whole, it may be said that within the middle half of the room the light front was practically a plane, and that, so far as the side lights were concerned, the illumination was as smooth and even as if the lights had been only a few inches centre to centre and the number correspondingly increased. While there was a constant decrease between the sides and centre, the relations of the factors in that decrease were those of a line, not of a point; and the reduplication of the light came where it was needed, not where it was not. Considered with relation to its position between the walls, a solid presented differences of illumination, but no contrasts. There were no contrasts; nowhere in the room could a place be found in which an intense light practically all in one direction would fall on a body with no opposite illumination. Differences of almost imperceptible value appear from a study of the curves; but there is no place where these differences increase to such value as to disturb the form image. Shade, distinguished from full light, is present everywhere; but shadow does not exist.

The part played by the lights at the two ends of the rooms is peculiar. They are small in comparison with the total illumination, and yet in their proper line of action they have a perceptible influence in producing the ultimate result. The angle at which the light of any other mantle hits a plane normal to this light is too small to make any great difference; but at the same time the change in direction counts. Differences in illumination due to the action of these lights may be seen nearly the whole of the distance from the wall to the middle of the rooms, and with tolerable certainty for about 20 feet—a result far more satisfactory than anyone could possibly expect, if the belief that disables effort because it anticipates failure had been allowed to control the plans of my friend the architect. To him rather than to me belongs the credit for the development of the scheme. I only did the work.

How far were we justified in regarding our rather costly experiment as worth while—that is, from the standpoint of scientific demands? The client was quite willing to say "to any extent;" but I am not. We certainly got out of the light all there was in it. The direct beam at 10 feet from the mantle gave an efficiency of 0·4 of a candle at the unit distance. The indirect beam should have given 6 × 0·4 candles; but it gave only 4 × 0·4 = 1·6 candles—perhaps more nearly 1·5 candles. This was due to the loss by reflection, and to the action of the enforced angle and the law of sines. Still the total amount of light falling on any surface near the axis of the room and between any two of the mantles was not far from five times as much as would have fallen on any surface of the same dimensions, and at the same distance from the centre of radiation, had the reflector been left out; and nearly one-fourth more than would have been given by the entire group of four lights at the same distance. This, reduced to its lowest terms, is the same as stating that the efficiency of each light was raised from 0·4 candle to nearly 2 candles—an increase amounting to about five times.

This gain is in increased efficiency alone, and belongs to the individual radiation centre. The absolute disturbance at the centre of the room from the side lights (the end ones being dark) amounts to the sum of the disturbances from each centre individually; or, since the efficiency was increased by five, the total sum of all those was the same as it would have been at the same distance from ten pendants, each containing five mantles, hung in the middle. This brings into strong relief what the gain really was. It was to be regretted that no surface could be found of sufficient stability to take the place of the nickel, which needs almost weekly attention to retain its power of reflection, and yet is the best surface we have.

Something was also gained in another and unexpected place—in the sensible height of the room. The eye accustomed to the brilliantly lighted ceiling and dimly lighted floor, naturally regarded this as the natural order of things; and the instinctive decision was that the comparative dimness of the ceiling was due to the height, while it was really due to the distance and the shadow from the mezzanine cornice. One perfectly familiar with the rooms, seeing them for the first time after the change, said, "I did not know that you had raised the ceiling."

I offer this as the record of an experiment, not as a belief in advocacy of an expedient. I do not think the result by any means ideal, nor by any means the best that can be gained, even with the defective means at our command. Certainly some to my mind palpable errors were made; but they seemed to be errors in the opinion of no one beside—certainly not to the owner of the house. Some of these I think I could remedy; some are absolutely in the nature of things, and beyond human aid. Were I to have another chance, I certainly should seek to avoid a tendency towards definite interference areas producing ghosts in the lines of light from the reflectors. If this account of my attempt should be a useful item in developing the study of internal illumination, I shall be satisfied.

REGISTER OF PATENTS.

Mantles for Incandescent Gas-Burners.—Burgess, J. F., of Regent Square, W. No. 1287; Jan. 18, 1897.

This invention relates to "the manufacture of illuminant appliances—such as mantles and the like—that are to be made with a vegetable substance that is termed mucilage. This substance is, by virtue of the solution hereafter described, produced in a finely-divided condition, in which state (when it is applied to gas and other burners) it gives out a full, brilliant, and powerful light; and it does not consume away, but remains efficient for a long time, and when heated to incandescence it is fairly tough and pliable, and not apt to rupture through vibration and the like. Mucilage can also be combined with rare earths or lime and the like."

The inventor thus describes his mode of procedure: I take mucilage or substances that contain mucilage, and subject them to a great heat until all combustible materials are consumed. I then take the ashes, dissolve the soluble portion of them in pure or aqueous acetate or nitric acid, and strain the solution. The nitrous solution must in any case be freely diluted before dipping the mantle shape into it, so as not to destroy it; but the acetate solution can be either aqueous or pure, according to the quantity of vegetable substance contained in it.

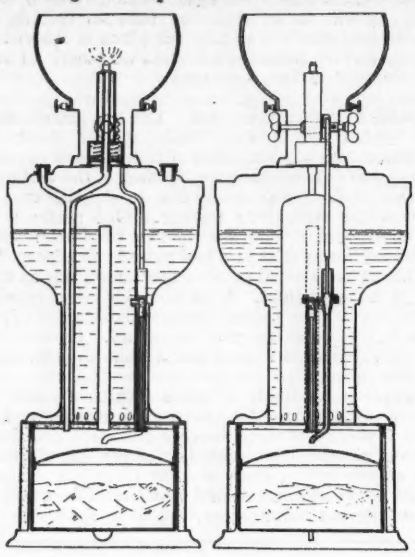
The vegetable matter in the solution is said to give "a full, brilliant, and powerful light when impregnated into any material that is of a porous nature, and that burns right away—such as wood, fibres, cotton, and the like, which when burnt leave only the refractory vegetable substances." For producing the frame of vegetable matter for illuminant appliances, the ordinary cotton mantle is dipped in the solution; and when dried and ignited, all the combustible materials are consumed, leaving only the non-combustible refractory vegetable substance, which retains the form of the appliance impregnated, and also the grain of the material into which it was impregnated. The substance, as already stated, when heated to incandescence, while emitting a brilliant light, is tough and pliable when heated, and fairly hard when cold, so that it is not apt to rupture from vibrations and the like. The ashes of the vegetable substance can also be combined with rare earths or lime and the like; being treated with acids in the manner already set forth, for impregnating porous materials, mantles, and the like.

Generating and Burning Acetylene.—Thompson, W. P.; a communication from A. Gobron, of Paris. No. 1784; Jan. 22, 1897.

The novel features of this apparatus (as shown in the engraving) are: (1) The mode of supplying the water to the carburettor, which is effected automatically according to the requirements of the consumption; (2) the method of regulating the pressure obtained by means of a safety-valve, which, when the maximum pressure is exceeded, delivers surplus gas to a supplementary burner, which consumes the surplus production until equilibrium of pressure and feed is completely re-established; (3) the method of regulating the feed to the carburettor by connecting it with the burner tap so that it is impossible to cause the water to reach the carburettor without opening the burner tap, and so that these two actions cannot be rendered independent for their respective function.

The generator (see p. 1400) is divided at about a third of its height by a plate; the part above the plate forming the receiver for the water, and the part below it the carburettor. At the centre of the water holder, and in a vertical position, is placed a bell communicating with the carburettor by means of a central tube. The carburettor is divided in its height into two parts by a moveable partition in the shape of a dome perforated with holes. The lower part contains the carbide of calcium; the upper part receives the gas produced in the carburettor, and acts as a gasholder. The roof of this holder is padded with felt or other absorbent material, intended to collect the moisture of the gas before this passes away to the burner. Above is placed the burner supplied with gas by means of a tube which communicates with the carburettor. A safety-valve in a cylindrical box is placed concentrically around the tube, having an adjustable spring controlling the valve. The supply of water to the carburettor is effected through tubes communicating with the bell, and preferably provided with a filtering device for purifying the water, and means or removing and cleansing it. The inlet-valve for the water is

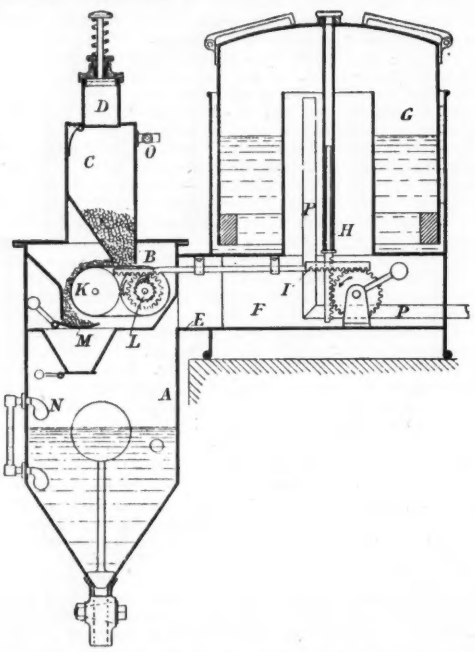
connected to the tap of the burner by a rack gearing into toothed segmental discs on the boss of the controlling valve, so as to permit of the opening and closing of the tap when the water-valve is closed, but not



the closing of the tap when the water-valve is opened. From this arrangement it results that the user is obliged to shut off the delivery of the water to the carburettor before closing the tap.

Production of Acetylene.—Thorp, T., of Whitefield, and Marsh, T. G., of Manchester. No. 1929; Jan. 25, 1897.

According to this invention, the carbide is introduced in a granulated or powdered state, in small quantities, into the liquid provided for setting up the chemical action resulting in the decomposition of the carbide; the granulated carbide being measured and admitted, by means of apparatus "operated by the pressure of the gas evolved, into the liquid at regulated intervals governed by the consumption or drawing off of the gas from the apparatus."



The generator A has a cover (opening inwards, and made self-closing by a spring or weight) over the orifice through which the carbide is introduced. There are also: An outlet-orifice for the gas generated; an outlet-orifice for the sediment, provided with a valve attached to a float, and a cock for discharging the sediment; and a water-level gauge. Above the generator is a chamber B, in which is part of the mechanism for feeding the carbide into the generator in definite charges. Above the chamber B is a hopper C, containing the carbide; the lower orifice being directly above the feeding apparatus. Above the hopper is a cylindrical shoot D, provided with an air-pump formed of a plunger, fitting the shoot and passing through the lid, and removeable with the lid. The plunger is normally held up by a spring; and its purpose is to force the carbide charged into the shoot through the flap-valve into the hopper B.

From the generator a conduit E leads into a chamber F, above which the variable capacity gasholder G is situated. The holder is constructed in the usual way with a bell dipping into a water-seal. The tank of the holder has a central trunk, inside which a tube fixed to the bell is arranged. A rod H (forming a rack at its lower end) is guided in the tube, and gears with a broad spur-wheel fixed on a shaft mounted in bearings. The shaft has fixed on it a weighted lever that turns the shaft and lifts the rack and rod H when the tube on the bell is lifted by the rise of the bell. Another rod I sliding in brackets is formed with a rack at each end, one of which gears with a broad spur-wheel, and the other with a spur-wheel mounted loose on a shaft L. On this shaft a drum and ratchet-wheel are fixed; a spring pawl swivelling on a stud screwed into the side of the spur-wheel engaging into the teeth of the ratchet-wheel. A second drum K is mounted on a shaft opposite to the other one, and an endless apron passes round the drums; the apron being underneath the outlet of the hopper C. By this means, the apron is moved forward, when the weight of the bell acting on the shoulder on the rod H forces it down, and thereby turns the wheels in the direction indicated by the arrows; but it remains stationary while the rack H is lifted when the bell rises, and the wheels are thereby turned in the opposite directions. When the apron moves forward, the carbide resting on it is carried along and dropped into the scoop M (supported on pivots, and held up by a counterweight), until the weight of the carbide overbalances the weight, when the scoop turns downwards and discharges its contents through the flap-door into the generator.

The gas is drawn from the apparatus through a cock O attached to the upper part of the hopper, so that it has to pass through the carbide and is dried thereby, or it may be drawn from the holder through a standpipe P.

Manufacture of Acetylene Gas.—Wise, W. L.; a communication from A. Paitti and Co., of Rome. No. 2129; Jan. 26, 1897.

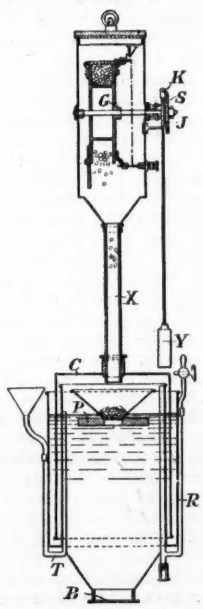
According to this invention—the specification of which is not illustrated—colophony and oxide of calcium (caustic lime) are together subjected to the action of water or acidulated water; the resulting chemical reaction "causing evolution of gas which can be employed for industrial purposes, such as lighting and heating, or in the production of motive power." The gas when used alone does not produce a very brilliant flame; so in order to adapt it for light-giving purposes, there is mixed with it gas produced by the action of water upon a mixture of carbide of calcium and carbonate of magnesia, or else there is added to the mixture of calcium oxide and colophony, carbide of calcium, or carbide of calcium and carbonate of magnesia. For the last-named mixture, the following proportions have been found suitable: Oxide of calcium, 80 parts; colophony, 10 parts; carbonate of magnesia, 5 parts; carbide of calcium, 5 parts. The oxide of calcium in the caustic state and the carbide of calcium are preferably used in the form of blocks, about the size of walnuts, and the colophony as fine powder. The carbide of calcium is laid at the bottom of the generator; the oxide of calcium above it; and the powdered colophony on the top. The water is gradually supplied from the bottom. The addition of carbonate of magnesium to the mixture is for the purpose of rendering the flame more luminous.

Gas-Lanterns.—Biheller, S.; a communication from the Actiengesellschaft, vorm. C. H. Stobwasser and Co., of Berlin. No. 2657; Feb. 1, 1897.

This invention relates to gas-lanterns of the class which consists of an upper part of metal with a metal chimney (with or without a second or inner chimney), and a closed lower part of glass forming the body of the lantern. Heretofore, when the lantern was to be lighted, the globe had to be lowered; but according to the present invention, a flap is provided in the chimney, and so mounted that (if there is no pilot-flame, or if the pilot-flame is not burning) a taper pushed against the flap moves it aside, and allows the flame to reach the gas within the lantern—the flap closing again automatically when the taper is removed.

Production of Acetylene Gas.—Barthez, A. H., of Hamma, Algiers. No. 9294; April 12, 1897. Date claimed under International Convention, Sept. 22, 1896.

This apparatus consists, first, of a receiver R having two compartments, the inner one of which—the generator—is supplied with water by a tube T. Within the inner compartment is a float P (made of cork or



the like), carrying a funnel-shaped container or basket closed at its lower end by a grid, upon which the calcium carbide rests. At the bottom of the receiver, a cover B is provided; and by removing this, the

deposits thrown down as the acetylene is generated are withdrawn. The outer compartment, together with a bell C, forms the gasholder. The bell slides with slight friction upon a tube or shoot X communicating with an upper receiver. The circular wall of the bell moves in water contained between the walls of the inner and outer compartments of the generator, and thus a hydraulic joint is formed between the bell and inner compartment; and the bell in rising gives motion to a weight Y. The gas for consumption is led by a pipe above the water-level in the holder, and passing outside the apparatus where it is provided with a stopcock.

The second part of the apparatus is a distributor, characterized by a deep receiver, supported above the lower receiver by standards attached to the latter, and with which it communicates by means of the pipe or shoot X. The upper receiver is closed at its upper part by a cover which, being furnished with india-rubber packing at its inner side, is adapted to hermetically close the receiver. Within this upper receiver a wheel G is mounted, having radial blades which, with the sides, form twelve separate tight compartments or buckets, each of which is furnished with a cover provided with india-rubber packing, and kept closed by a small lever V. The wheel is mounted on a shaft carried in bearings, and extending outside the receiver where a ratchet-wheel S is keyed upon it. A lever J is also mounted loosely on the shaft between the ratchet-wheel and the receiver; and it carries upon the one side of the shaft a pawl for actuating the ratchet-wheel, and a cord from which depends a weight adapted to rest upon, and be raised with, the bell of the gasholder as stated. The other end of the lever carries a counterweight K, which causes the lever to oscillate to a stop at this side when the weight is raised by the bell. There is a pawl for preventing the backward rotation of the wheel G. A stop is also provided which limits the descent of the lever when the bell is lowered; and "the amplitude of oscillation of the lever allows the wheel to be rotated exactly the extent of one of its buckets at each descent of the weight Y." An operating button upon the outer end of a rod sliding with slight friction, and mounted at the side of the upper receiver, allows the working of the apparatus to be started or stopped.

Manufacture of Anhydrous Ammonia.—Krebs, H. J., of Wilmington, Del., U.S.A. No. 17,313; July 22, 1897.

This invention relates to the distilling, condensing, and purifying of condensable gases under high pressures, and especially to the manufacture of anhydrous ammonia.

Heretofore, says the patentee, anhydrous ammonia has been distilled from aqua-ammonia in low-pressure stills, and the gaseous matter withdrawn therefrom and condensed by means of pumps. It has also been prepared by distillation under high pressure; and, after cooling, liquefied in a receiver by the pressure maintained in the still. It has, however, been found difficult to free the ammonia completely from the water and other impurities—such as hydrocarbon compounds—even when additional appliances were employed; and except when the residual water was used for the re-absorption of ammonia (as may be done when the operations are conducted in connection with absorption refrigerating apparatus and in like situations), there is loss due to the imperfect distillation of the ammonia from the water. The special objects of the present invention are to provide processes and apparatus by which from aqua-ammonia pure condensed anhydrous ammonia may be continuously produced.

The separation of the ammonia from the water and from the impurities present is accomplished by a primary and a secondary or refining distillation and condensation; the refining distillation being effected at a lower temperature than the primary distillation, whereby the impurities remaining are entirely separated. The loss of ammonia in the residues of these distillations is prevented in the primary distillation by a return of the residue to the still in the form of steam, so as to effect the distillation; and in the refining distillation, loss is prevented by a re-distillation of the residue—the product of such re-distillation being returned to the body of the refining-still, and the residue run off as waste. These operations may be carried on in any suitable form of apparatus operated upon either of the plans above referred to—that is, distillation may be produced at relatively low temperatures and pressures, the condensations being effected by means of pumps; or the distillations will preferably be carried on at a temperature and pressure sufficient to effect the condensations of the ammonia.

The process in its entirety—considered apart from any apparatus which may be employed—is as follows: The aqua-ammonia from which the ammonia is to be separated free from impurities, is gradually heated to a temperature at which, at the pressure maintained, it will give off substantially all its contained ammonia. The residue is then vaporized, and returned in that condition through the solution of aqua-ammonia being treated; and by means of this vaporized water containing the residual ammonia, the aqua-ammonia is raised to the desired temperature, and the ammonia separated therefrom. The further separation of the ammonia from the watery vapour is effected by cooling; and the reduction of the former to a liquid is caused by cooling and pressure. The liquid thus produced is refined or further purified by subjecting it to a much lower degree of heat; condensing the vapours so produced; subjecting the residuum of the distillation to a further distillation; and cooling and returning the vapours thus produced to the mass of impure ammonia. The condensed vapours forming the product of these distillations constitute a perfectly pure anhydrous ammonia.

Producing and Storing Acetylene.—Bell, H. J., and the Niagara Falls Acetylene Gas Machine Company, Ltd. No. 19,411; Aug. 23, 1897.

This acetylene generator is substantially similar in construction to that described in patent No. 2284 of 1897 (see "JOURNAL" for May 25 last, p. 1193); but it is provided with a screw top, instead of the water seal top shown and described in the former case. The object now aimed at is an improvement in the means of feeding measured quantities of water to the generator, and in other minor details of construction.

Burner for Acetylene Gas.—Lebrun, G., and Cornaille, F., of Paris. No. 20,574; Sept. 7, 1897. Date claimed under International Convention, March 4, 1897.

This burner for acetylene gas and other gases rich in carbon consists of a hollow cylindrical body having thin walls, and made of glass or other material which is a poor conductor of heat. Its upper rounded extremity is made of paraboloidal form, provided with an emission orifice for the gas—made trumpet shaped on the exterior, and rounded on the interior, so that the heating of the burner during combustion, and the accumulation of carbon deposits, is minimized. The burner is sealed in a metal socket, having a central perforation at its base, so as to act as a moderator, and ensure the interior of the burner being kept free from deposit.

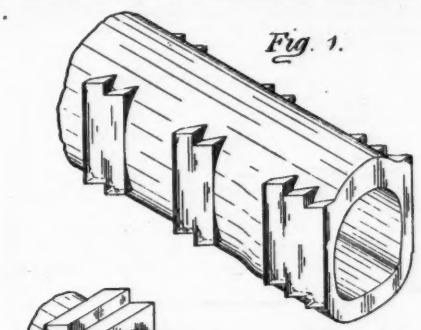
Gas and Mineral Oil Motors.—Martha, L., of Paris. No. 20,617; Sept. 8, 1897.

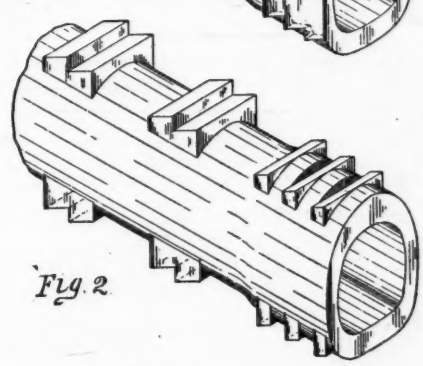
The patentee claims the use, in a gas or mineral oil motor, of a helicoidal canal arranged around the cylinder, and communicating by one extremity with the cylinder admission-valve; by the other extremity with the atmosphere; and at one point between the extremities, with a mineral oil reservoir or a gas-conduit. By the aid of a valve, this is commanded at a proper moment, and in a suitable manner. The carburation of the air and the gaseous mixture is operated in the canal; and this operation has as a result the cooling of the cylinder, owing to the circulation of air, to which is added the cooling due to the evaporation of the mineral oil if the motor is worked by this sort of liquid. It is said that this system simplifies the machine, and at the same time ensures the production of a perfectly homogeneous gaseous mixture—an essential condition to avoid failures.

Certain parts of the invention may be generalized, and applied to actual systems of motors in which the cooling is obtained by water.

Inclined Retorts.—Cliff, W. D., and the Leeds Fire-Clay Company, Limited, of Wortley. No. 21,989; Sept. 25, 1897.

This invention has for its object to distribute the weight of the inclined retort more evenly throughout the setting, and to avoid or reduce any strain at right angles to the supporting walls, due to the inclination of the retort or the seating. For this purpose, the patentees propose to form brackets or projections at or near the front and back ends of the retort, and also at suitable intervals along the length of the retort, having vertical and horizontal surfaces or seatings, both at right angles to the vertical plane passing through the centre line of the retort. These brackets may be formed on both sides, or on the top and underside of the retort. When formed on the sides of the retort, the brackets have vertical and horizontal surfaces at the bottom, or at the top and bottom; the brackets near the ends being preferably formed with triple seatings, and the intermediate brackets with double seatings, at the top and bottom. The sides of the brackets are most conveniently plain vertical surfaces parallel to the length of the retort; and it is claimed that this construction of retorts renders superfluous the use of special blocks and tiles in the building of the flue-walls of the setting.





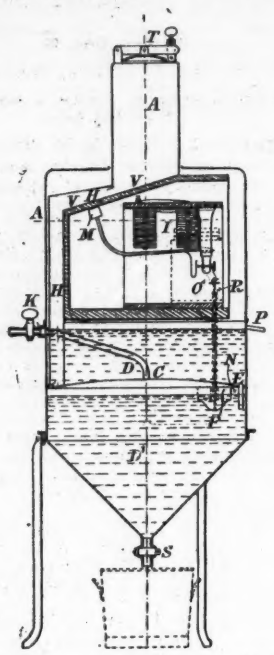
Figs. 1 and 2 are isometrical perspective views of inclined retorts constructed in accordance with the invention; the former being provided with side brackets, and the latter with top and underside brackets. In fig. 1 the side brackets are formed with horizontal seatings and vertical faces both at the top and bottom. The brackets are formed on both sides of the retort, and rest on, or are built in, the vertical supporting walls, which usually run at right angles to or across the retorts. The end brackets preferably have triple seatings, and the intermediate brackets double seatings—both on the top and bottom.

Production of Acetylene Gas.—Bosshardt, F.; a communication from A. Molet, of Buenos Ayres. No. 23,198; Oct. 9, 1897.

This apparatus (see p. 1402) is for the production of acetylene, by means of the gradual fall of fragments of calcium carbide into water as the consumption of the gas takes place.

The carbide is introduced through an air-tight cover T in the box A, which communicates in its lower portion with a conduit or channel H, connected at J with a plate C, adapted to divide horizontally the water-reservoir D D^1 into two parts, which communicate with each other by means of the pipe E. The bottom V of the box (which at the same time forms an integral part with the conduit H) is only slightly inclined, so as to prevent the carbide from falling by itself, but sufficient to provoke the fall when a series of vibrations are communicated to the bottom V, by

means of the hammer M, to which, either by mechanism or by electricity, motion is communicated whenever it is necessary to cause the fall of the carbide.



At the beginning of the operation, the reservoir D D¹ is filled with water. In falling into the water, the carbide is decomposed into lime, which goes to the bottom, and into acetylene gas, which is stored under pressure under the plate C, displacing its own volume of water, which passes to the upper part of the reservoir through the channel E. The movement of the water is produced in a reverse direction whenever the amount of gas diminishes. The gas produced is then directed towards the outside through the conduit C, provided with the cock K.

In order to automatically regulate the movements of the hammer M, a float F is arranged which ends in a rod R, which passes freely in a small pipe. When an electric hammer is employed (as indicated), the rod R is provided with a contact O, which cuts off or re-establishes the electric current which goes from the battery to the electrode I. When a mechanical movement is employed, the rod operates a check or click. However little the amount of gas stored is increased, the level N will descend, as well as the float; and thereupon the interruption of the movement of the hammer is effected. On the other hand, whenever by consumption the volume of the gas is reduced, the float will rise and re-establish the movement of the hammer.

The formation of the lime-residue tends to increase the volume of the water contained in D D¹; and the discharge-pipe P permits the exit of this excess of water. The discharge of the lime milk stored at the bottom D¹ is effected by a valve S.

APPLICATIONS FOR LETTERS PATENT.

29,433.—Kinsey, H., "Generating and storing acetylene gas." Dec. 13.
29,465-8.—New, A. G., "Explosion engines." Dec. 13.
29,471.—Lucas, R. N., "Explosion engines." Dec. 13.
29,475.—Dvorkovitz, P., "Incandescent gas mantles." Dec 13.
29,499.—Folwell, P. C., "Automatic cut-offs for gas-burners." Dec. 13.
29,571.—Thiersant, H. de, and Coulson, W. A., "Acetylene gas producer." Dec. 14.
29,573.—Newton, H. E., "Air and gas pumps and compressors." A communication from C. C. Worthington. Dec. 14.
29,593.—Lloyd, E. F., "Explosion engines." Dec. 14.
29,617.—Loup, E., "Generators for acetylene." Dec. 14.
29,628.—Lake, H. H., "Production of acetylene gas." A communication from W. A. Shearer. Dec. 14.
29,672.—Brightman, J., "Prepayment gas-meters." Dec. 15.
29,681.—Crosta, L. W., and Taylor, J., and Sons, Ld., "Silencer for the exhaust of gas and other motors." Dec. 15.
29,683.—Goodwin, J. S., "Acetylene generator." Dec. 15.
29,767.—Smith, W. B., "Mantles to be heated by gas." Dec. 16.
29,771.—Jack, T. B., "Gas generating and burning lamps, lanterns, and the like." Dec. 16.
29,780.—Robinson, W. G , "Explosive engines." Dec. 16.
29,790.—Meldrum, J. J., T. F., & J. W., and Clayton, F., "Mechanical stokers." Dec. 16.
29,796-7.—Bernstein, M., "Process for manufacturing incandescent bodies" Dec. 16.
29,805.—Johnson, J. Y., "Improvements connected with pipes and conduits, for localizing the effect of explosions therein, and so minimizing danger therefrom." A communication from E. Fouche, representing La Compagnie Française de l'Acetylene dissous. Dec. 16.
29,828.—Jürgens, E. & J. F. C., "Igniting-pills for illuminating-gas." Dec. 16.
29,830.—Walker, H., "Burners for acetylene." Dec. 16.
29,843.—Smith, F. H., "Production of acetylene." Dec. 16.
29,850.—Jones, W. J. H., "Prepayment and postpayment gas-meters." Dec. 16.
29,934.—Wolff, L., "Incandescent gas-lamps." Dec. 17.
29,960.—Wagner, M., "Manufacture of acetylene gas."
29,963.—Guppy, J. J., "Mantles for incandescent gas-burners." Dec. 17.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Destructor Furnaces and Electric Lighting.

Sir,—We observe in your issue of the 7th inst. various remarks referring to the application of the heat obtained from dust destructors for the purpose of producing steam for electric lighting stations. We think, however, from the tendency of your remarks, that you are looking upon this question as if the sole object of a dust destructor installation was to produce steam for electric lighting purposes. As the original introducers of destructor furnaces, and as the firm responsible for by far the greater number of those which have been erected, we beg to point out that this is not the case.

When destructor furnaces were first introduced, the authorities who erected them, as a rule, had no use for steam, even if it were produced; and in some cases at any rate the refuse to be burnt in the furnaces was of such a character that very little steam production could be expected from it. As instances in question, we may mention the destructors at Letts Wharf, erected many years ago, by the Commissioners of Sewers of the City of London. A steam-boiler of considerable power, and a large steam-engine, were included in this plant. Though there was no lack of steam, the engine has practically never done a day's work since it was erected; and the boiler has only been used for the production of steam for hoisting the refuse to be burned on to the top of the destructor furnaces. Again, the ordinary ashpit refuse of Bradford, according to experiments made in October, 1887, and reported by Thomas Codrington, Engineering Inspector of the Local Government Board, in a report issued in 1888, contained an average of 47 per cent. of water, and left after burning 33 per cent. of clinker and ashes; so that not more than 20 per cent. of the refuse could possibly be actually burned. Such a refuse naturally would not be likely to produce much steam. Very many important towns erected destructor furnaces during this period, with no intention of utilizing the heat evolved for any purpose whatever, but simply as the most sanitary and effectual way of dealing with their refuse.

Later, however, two things happened. The quality of the refuse to be dealt with in many cases improved, through better methods of storage and collection; and also the local authorities found out that they could utilize the heat, or the steam and power, which could be produced from it. With these changes, alterations in the construction and arrangement of destructor furnaces have taken place. Even at the present day, supposing the refuse collected to have (say) one-eighth of the calorific power of coal, if it were necessary on bringing it to an electric lighting station to pay one-eighth of the price of coal for it, probably no sane man would think of utilizing a destructor for producing power for electric lighting. These, however, are not the conditions.

In the last number of the "Contract Journal" (that dated Dec. 15), there is a report of the proceedings of the Vestry of St. George-the-Martyr, Southwark; and it is stated that the Vestry agreed to pay Mr. Murrell 2s. 4d. with each ton of refuse which they delivered to him at his shoot at Blackfriars Bridge. We understand that the Vestry of St. Luke's pay to the Shoreditch Vestry 3s. with every ton of refuse which the Shoreditch Vestry accepts from them, in order to put it through their destructor furnaces. We have therefore got to this point: First, that destructor furnaces must be erected for dealing with refuse, whether the heat which they generate is used for the production of steam or not. Secondly, that those who have refuse to deal with are ready to deliver it to anyone who is willing to accept it, and also to pay with each ton of it some 2s. or 3s. And, further, there is the fact that this refuse can be used for producing steam. The question is, Shall the heat which it generates go to waste or shall it be usefully employed?

You quote some correspondent, stated to claim practical experience in such matters, who says that "to suggest, or expect, that electric light stations of any importance can be worked by burning household refuse only, no matter the quantity available, is a gross absurdity." In the number of the "Contract Journal" above referred to, there is a report of the proceedings of the Lighting Committee of the Shoreditch Vestry at their last meeting. Mr. Kershaw, the Chairman of the Committee, then stated officially that for the last fortnight they had not burned a pennyworth of coal. Now Mr. Kershaw speaks with knowledge and authority, and gives an official utterance. At any rate, he is a man with a name—and he is not ashamed that it should be attached to his statements—which apparently is more than the said correspondent can claim. What becomes of the experience of that correspondent when confronted with the facts? Before the Atlantic cables were at work, it was quite easy for anybody to say that it was utterly impossible to wire a message under the Atlantic from Europe to America; but when they were once working, no amount of experience in anybody who made such a statement would carry weight. So it is with electric light stations worked by refuse.

You speak of the magnitude of the coal heap at Shoreditch. When a coal heap receives additions, and nothing is taken from it, it naturally grows big. This appears to be the condition of Shoreditch. Like wise people, they provide for emergencies. If heavy snow came upon the Metropolis, refuse could not be collected quickly, if at all; and if they had no refuse and no coal, their electric lighting would stop. They cannot store refuse in large quantities—partly because of its bulk, partly because it is undesirable to keep it, and partly because it would be costly to handle. They provide for emergencies by storing coal. So do gas-works; and people think that they are wise in doing so.

You quote a statement, apparently by Mr. J. Beresford Bolton, that "we hear that it is found necessary to burn 30 tons of coal a month." Who has heard this? and what is the authority? As you are well aware, reports unless tested are not worth much; and by the way who is Mr. J. Beresford Bolton? He appears to be quite willing to give his views to the public; but of what value are they when given? His name does not appear among the members, or even the associate members, of either of the great Institutions of Engineers—the Civil or the Mechanical. What authority has he to speak? Is he trying to get a reputation out of statements based on no experience, and having no authority? You will find that Mr. Kershaw states plainly that 100 tons of coal have been ordered to be kept in stock. You will further find he mentions that, before the present plant at Shoreditch was ordered, it was contemplated

as possible that one ton of coal per day might be burned; so that even on this basis it was considered desirable to use destructors. He states, however, that the one ton of coal per day has not been used; and, further, as above stated, that not a pennyworth of coal has been burnt during a fortnight.

Your article mentions the output at Shoreditch as being 250 kilowatts of electrical energy; and you say that the house refuse of a population of 146,000 people goes to the production of this energy—implying that this is the utmost amount that can be produced from the refuse. As a matter of fact, the whole of the energy wanted is being produced from refuse; but that does not in any way indicate how much energy the refuse is capable of providing. The one thing that is apparent, is that the limit of production has not yet been reached. It may be said, Why then is refuse being taken from St. Luke's? The reply to this is clear. The cost of burning the refuse is very much less than the amount of money received with it; consequently it pays to have it, even though no power whatever is derived from it. When the plant at Shoreditch was erected, it was not contemplated by anybody that it would provide the necessary electrical energy during Sunday. The collection of refuse ceases somewhere about midday on Saturday, and no more comes into the yard until Monday morning; and during a considerable part of this time it was expected that it would be necessary to fire with coal. Yet the record is before us that coal has not been used for a fortnight; showing that there has been sufficient storage of refuse to provide all the electrical energy needed, even during the period when refuse was not being collected.

You make reference to Ealing as an instance of the unsatisfactory results obtained when destructors are used in connection with electric lighting stations. As a matter of fact, some power was being used at Ealing before the electric lighting station was put up; and, further, the arrangement of destructors at Ealing is the earlier arrangement, not specially adapted for the production of steam. Any steam passing over from the destructor plant to the electric lighting works, can only be steam not required for the purposes apart from electric lighting; and, further, it is produced from a plant not erected with any view of utilizing the refuse to the best advantage as a means of producing heat. You give a very good reason indeed why the consumption of fuel should be large at Ealing; and whatever else may be the case, it has not been increased by the fact that there are destructor furnaces there. Possibly, however, some steam from the electric lighting plant may be used for purposes other than electric lighting. As to this we know nothing; but if it were the case, it might to some extent account for what you consider a very high consumption of fuel.

We hope this letter may throw some light upon the question of the use of destructor furnaces.

Nottingham, Dec. 20, 1897. MANLOVE, ALLIOTT, AND CO., Limited. (Thos. Cantrell, Secretary.)

[Owing to our Editorial Columns being full this week of seasonal matter, we must defer to another issue any reply which the above communication may call for at our hands.—ED. J.G.L.]

A Three-Storeyed Gas-Works.

SIR,—I notice in your issue for the 14th inst. that Mr. G. Livesey, in his report on the proposed new site for the Edinburgh and Leith Gas-Works, refers to a design for a three-storeyed gas-works which was submitted in competition for new works at Manchester twenty years ago. This design ("Rainbow"), which was very eccentric in many respects, was by Mr. John Depledge. I was privileged to see the design before it was sent in; and I am sure Mr. Livesey would be very dubious as to the seriousness of the author's proposal had he known the man. That Mr. Depledge was an engineer of some repute, and might have submitted a more tangible scheme, is borne out by the fact that the third premiated design in the competition referred to ("Omne Trinum Perfectum"), which was submitted by Messrs. Newton, Chambers, and Co., was the unaided effort of his pupil,

Thorncliffe Iron-Works, Sheffield, Dec. 20, 1897. W. FROGGATT.

Gas Workers' Superannuation.

In a letter on the above subject which appeared in the "JOURNAL" for the 14th inst., "Secretary" expressed a desire for information as to any small works where a superannuation fund is in operation. We are not aware that there is one. It may be of interest to our correspondent to know, however, that in 1841—the year before the South Metropolitan workmen's sick fund was founded by Mr. George Livesey's father—the quantity of coal used was only 6300 tons; and there does not appear any special reason why such a fund, and a superannuation fund also, should not be established in smaller works. The latter fund was started by the late Mr. Livesey in 1855, when the Company used 26,000 tons of coal. In the course of a letter on this subject, Mr. G. Livesey remarks that a limited number of men cannot carry on such funds, because they are too small to obtain the assistance of the law of averages; but if the company pay half the cost, as they may well do, the average can, without difficulty, be spread over a number of years—that is, if there should be a heavy charge one year, it would not matter to the company, as they would get the relief at a future time, while a heavy charge in any year on a very small society would break it up. In 1895, Mr. Livesey read a paper before the Incorporated Institution of Gas Engineers, in which he gave particulars and the cost of maintenance of these funds. It will be found in the "JOURNAL" for May 14, 1895 (p. 1002).

Fatal Gas Explosion at Bristol.—On the 18th inst., an explosion of gas took place at 12, Twinnell Street, Bristol, causing serious injuries to two of the occupants—Mrs. Greenwood and her daughter, aged 13 years. Both were conveyed to the Royal Infirmary, where the latter died last Tuesday. At the inquest it was shown that the accident was caused by Mrs. Greenwood carrying a light into a room which had not been used for some time, and in which a quantity of gas had been escaping from a defective pipe. An explosion followed; the place being nearly wrecked. The jury returned a verdict of "Accidental death."

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Monday, Dec. 20.

(*Before Lords Justices* A. L. SMITH, RIGBY, *and* COLLINS.)

Incandescent Gas-Light Company, Limited, v. Reimer—Discharge of a Committal Order.

This was an appeal from an order by Mr. Justice Day, in Chambers, committing the defendant Reimer and his employer, Mr. Tossell, to Holloway Prison for contempt of Court. Reimer had been taken to prison the previous Saturday; but Tossell had not been arrested.

Mr. NEVILLE, who appeared for Tossell, said the plaintiff Company had, on the 19th ult., obtained an injunction against Reimer for infringement of their patents. He was a clerk in the employment of Mr. Tossell, who carried on business in Jewry Street as the Incandescent Gas-Fittings Company. There he sold burners and other fittings for incandescent lighting, but did not deal in any infringing materials. In his spare time, it appeared, he had sold infringing mantles; and accordingly an injunction was obtained against him. On the same day, an order was also obtained appointing Mr. G. A. Gutch, Assistant-Manager to the plaintiff Company, a receiver of infringing articles, as well as of books and papers. On the 25th of November, as Mr. Reimer was entering a restaurant in the City Road, having with him a black bag, he was accosted by two men—Barnett and Moore—detectives in the service of the plaintiff Company, who produced the receiving order, and said it authorized them to search his bag. He opened it, and showed the contents, which were price-lists of his employer Tossell. After he had closed it, Barnett snatched it out of his hand, took out the papers, refused to give them back, and went away with them. A day or two after, an application was made to Mr. Cluer, the Magistrate, for a warrant, which was refused; but on Nov. 26, as Barnett was standing outside No. 31, Jewry Street, Reimer and Tossell gave him in charge for larceny; and he was taken to the police station, and kept in a cell all night. Next day he was brought up at Worship Street, and remanded till the 3rd inst., when the prosecution was withdrawn. Thereupon a summons was taken out by the plaintiff Company against both Reimer and Tossell for contempt of Court; and Mr. Justice Day made the order for committal. He submitted that there had been no contempt. The receiver had no right to delegate his functions to two men like Barnett and Moore; and even if he himself had been the person concerned, he had no authority whatever, under the order appointing him, to follow Reimer into the restaurant and take from him papers belonging to Tossell. Moreover, there was no evidence that Tossell even knew of a receiver having been appointed.

Mr. WARBURTON, for Reimer, having added a few words on behalf of his client,

Mr. WALTER pointed out the difficulty the plaintiffs had in enforcing their rights, and said there had been so many cases of this kind before Mr. Justice Day that he had made the order in question to assist them in putting a stop to the infringements which were constantly going on. He submitted, at some length, that the agents of the receiver were acting *bonâ fide* in the belief that they were carrying out the order of the Court, and that when so acting they were entitled to protection. Mr. Justice Day said he had never met with a grosser case of contempt.

Lord Justice A. L. SMITH said the order could not stand. He would say nothing about the receivership order, except that it was a remarkable one, and went farther than he had ever seen such an order go before. It was a subsisting order, but it must be read as meaning only books and papers relating to incriminating matters.

Lords Justices RIGBY and COLLINS gave judgments to the same effect.

The appeal was allowed with costs, both Court and Chambers.

Brebner v. The Urban District Council of Aberdare.

This was an appeal by the plaintiff, the Contractor for a reservoir and certain water-works, from an order made by Mr. Justice Day in Chambers, referring an action brought by him against the defendants and Mr. W. FOX, the defendants' Engineer.

Mr. SCOTT, who appeared for the plaintiff, said the question arose out of the refusal of the defendants to pay a certain amount due under the contract, in accordance with the Engineer's certificate, whereby the plaintiff said the defendants had prevented him from carrying on the work—that they had, in fact, repudiated the contract, and could not therefore rely upon the arbitration clauses in it. He further contended that the question in dispute was one of law, which was not contemplated in the arbitration clause; and still further that Mr. Fox had made an affidavit giving his view of the facts, and was therefore not qualified to act as arbitrator.

Mr. DANKWERTS appeared for the defendants; but he was not called upon.

Their LORDSHIPS were unanimously of opinion that the appeal failed, and must be dismissed.

Mr. DANKWERTS asked leave to state that the defendants had not refused to pay the amount of the certificate; but the plaintiff assumed that they would, went off to Scotland to see his solicitor, and at once commenced the action.

The Incandescent Gas-Light Company's Patents.

In the Bill Chamber of the Court of Session on the 18th inst., Lord Pearson had before him three applications by the Incandescent Gas-Light Company, Limited, asking interdict against the alleged infringement of their patents. The respondents were Morris (or Morrice) Frank, carrying on business at 400, St. Vincent Street, Glasgow; John Grieve, plumber and gas-fitter, of 486, Duke Street, Glasgow; and David Felix, carrying on business as the North British Incandescent Gas Lighting Company at 31, Argyle Street, Glasgow. It was asserted of all three

respondents that they had been selling mantles which were infringements of the complainers' patents. Of the respondents Frank and Felix it was said that complainers believed they were persons without means, who not only sell the alleged infringing mantles in Glasgow, but who hawk or sell them in other towns in Scotland. Of all the three it was asserted that they issued business cards or price-lists, in which they guaranteed that the mantles in which they deal were not infringements; and complainers found that the public were thus led into purchasing these mantles, thereby becoming themselves liable to proceedings. They had purchased mantles from the respondents and had had them analyzed; and the analyses, they said, corresponded with those obtained in cases in which they had obtained injunctions in England. Mr. Clyde, for the complainers, said they offered complete caution. He asked for interim interdict. His Lordship ordered the respondents to lodge answers, and granted Mr. Clyde's request.

Unlawfully Illuminating an Empty House.

At Poole Petty Sessions last Thursday, H. M. Selpe, jeweller, of Poole, was charged with improperly laying a pipe communicating with one of the Poole Gas Company without their consent, and using the gas. He was fined £5. It was stated that the defendant took an unoccupied house, laid on the gas, and burned it in nearly every room day and night for a week. He did not reside in the house; and the fact of the lights burning all night alarmed residents in the neighbourhood.

MISCELLANEOUS NEWS.

EXTENSIONS AT THE WIDNES GAS-WORKS.

Opening of a New Retort-House.

Last Tuesday the new retort-house which has been erected at the Widnes Corporation Gas-Works was formally opened by the Mayor (Mr. Alderman Wareing), in the presence of a gathering of about thirty gentlemen, among whom were Mr. Isaac Carr, Assoc.M.Inst.C.E., the Engineer and Manager of the works, Mr. Alderman Timmis and Mr. Davies, the Chairman and Deputy-Chairman of the Gas and Water Committee of the Corporation, and other leading members of the Corporation. The party assembled at noon in the new house, and after a few introductory remarks by Mr. Alderman Timmis, who said he believed it to be the most economical and most cheaply-constructed retort-house in the country, the Mayor performed the official opening ceremony by throwing a shovelful of coal into one of the retorts. The party then made a detailed inspection of the plant.

The retort-house just completed has been built on to the south-east end of the old No. 1 retort-house, and on the site formerly occupied by the engine and boiler house, condensers, scrubbers, &c. It is a brick building, the outer walls of which are relieved with red sandstone facings and blue pressed bricks, while the roof is of steel, and slated. The inside dimensions are: Length, 90 ft. 6 in.; width, 62 feet; height from ground-floor level to eaves, 28 feet; height to apex of roof, 44 feet. The height from the level of the stage floor to the eaves is 22 feet, and to the apex 38 feet. The gable wall of the old retort-house has been taken down, throwing both the old and new buildings into one house; making the total length 174 ft. 6 in. The house is ventilated and lighted by means of 10 doorway and 35 circular openings in the side walls, and a continuous ventilator along the roof. The building is spacious and commodious, and affords exceptionally favourable conditions for the stokers in carrying on their work.

The carbonizing plant consists of eight settings of seven ⌂-shaped retorts, 16 in. by 20 in., and 20 feet through; making 112 mouthpieces, having a total gas-producing capacity of 600,000 cubic feet per diem. The retorts are fitted with self-sealing lids, and are heated by improved regenerator furnaces; there being one furnace only to each through bed, as against two on the old system. This alteration will necessarily effect a great reduction in the labour of firing and clinkering, as well as in the consumption of coke for heating the retorts. The steel framing for bracing the retort-bench together also carries the hydraulic mains and other overhead ironwork, and is so constructed as to be unaffected by expansion and contraction of the bench. This is obviously an important advantage over the system by which hydraulic mains are supported direct from the brickwork of the bench, in which case the constant movement throws them out of level, causing unequal seal on the dip-pipes, and uneven pressure on the retorts. Special overflow valves are provided for regulating the water-level in the hydraulic mains; and the tar and liquor outlet pipes are arranged for drawing off first of all the heavy tars, thus preventing the formation of thick pitchy tars at the bottom.

It is intended during the coming year to erect some mechanical coke elevating plant to facilitate storing and rapid loading of the material in large quantities. The space available for coke storage is limited, and at the present time a stock of 200 tons causes inconvenience. The whole of the erection, with the exception of the iron coal-shed, has been carried out by the Corporation's own men; and the work when finally complete will have cost about £4500, exclusive of the proposed elevating machinery. This figure works out at £40 18s. per mouthpiece, including building, coal-store, and plant; the cost of the retort-bench alone being £26 7s. per mouthpiece. This is an exceedingly low figure; and is little more than half the cost of similar plant recently erected elsewhere. In fact, with the retort-house building and coal-shed included, the cost per mouthpiece at Widnes is considerably below that of the retort-bench alone in the case referred to. The new coal-shed is of corrugated iron, 92 feet long and 46 feet wide, and has a storage capacity of 400 tons. The roof of this shed has been extended over a double line of rails, to afford shelter to the workmen discharging the waggons.

The increasing demand for gas has been so great this year that every available retort in both the old houses has for the past fortnight been in use, and is only sufficient to meet requirements; so that the new plant is ready just in time. The total gas-producing power of the works is now about 1,600,000 cubic feet per day. The existing gasholder capacity is 1,200,000 cubic feet. The maximum day's make so far this year has been 906,000 cubic feet, and the consumption 922,000 cubic feet. The total coal storage is 1800 tons, or equal to twenty days' supply with the present make, and thirteen days' supply when the works are employed up to their maximum. The expenditure on the alterations and extensions, including the new holder at Ditton, will amount to about £21,635. The total capital sunk in the works is £94,078, less £24,232 paid off; making the present capital £69,846. The make of gas has increased from 83 million cubic feet per annum in 1886 to 183 millions in 1896. This year it will be about 181 millions; and the estimate for 1898 is 200 millions. The number of consumers in 1886 was less than 1000; whereas at present the ordinary consumers number 2000, in addition to 2622 slot-meter consumers—making a total of 4622. The number of men and boys at present employed by the Gas Department is 150; and the amount of wages paid per annum, £7668. It is interesting to note that whereas the capital invested to produce 1000 cubic feet of gas was 16s. 6d. in 1882, it is now only 7s.; and if the plant were working at its maximum, this would be reduced to 3s. 11d.—thus showing the great improvements effected during the above period.

After the inspection, the party proceeded to the Central Hotel, where luncheon was served, which was followed by a series of toasts. In proposing the toast of the Gas and Water Committee, Alderman Quinn referred to the fact that, whereas in 1892 the gas-producing capacity of the works was 1,000,000 cubic feet per day, it was now 1,600,000 cubic feet. In 1892, the water pumped at the water-works was 3 million gallons; and it was now 4½ millions. Mr. Davies responded to this toast. Mr. Shones proposed—"The Engineer and Staff." The series of retorts they had seen that day were, he said, something quite novel, and were placed there at very much less than the cost of similar appliances in other works. The undertaking controlled by the Committee was productive of great profit to the town. The output had increased 13 per cent. during the last forty weeks or so. Mr. Carr, in responding, said that the continued prosperity of the gas-making industry in the town could not but be a matter of gratification to everyone concerned. He would like to say a few words with regard to the subject of electric lighting. He had kept himself well posted on this matter, so that he might be able to give an opinion whenever called upon to do so. The fact that they had not yet gone in for electric lighting was in their favour. They had not lost anything by waiting; on the contrary, they had rather gained. As evidence of this, they had the fact that a number of neighbouring towns that had gone in for electricity had had to face very heavy financial losses, which they would feel for many years to come. The causes of these losses were practically two: In the first place, the cables as at present constructed were very far from perfect, and great loss of energy arose from this source; and, in the second place—and this was the principal reason—all attempts that had hitherto been made towards the commercial storage of electricity had proved futile. Electricity could not be commercially stored at present; this was an admitted fact with all electricians. What would their position as gas makers be, if they were unable to store their gas? Their works at Widnes would, to meet their demands at the present time, have to be three times their existing size. They made throughout the day 40,000 cubic feet of gas an hour; but during the hours of heavy consumption, between 5 and 7 o'clock, they were sending it out at the rate of 120,000 cubic feet per hour. To make up this quantity, they drew on their gasholders. At some times during the day, the consumption fell to, say, about 5000 cubic feet per hour; and the rest of the 40,000 cubic feet produced was put into the gasholders to be drawn upon as required. This was a very great advantage for gas; and electricity was very seriously handicapped in this respect. The electric generating plant must be equal to the maximum consumption; and every new consumer meant additional power required. This was not so with gas, as long as they had their holders. In small towns, this disadvantage of electricity was most felt, because the light was only used during the hours of darkness. In London, Manchester, Liverpool, and other large places, where there was a considerable day, as well as an all-night consumption, the dynamos had always something to do; but in Widnes they would have the engines running during the lighting hours and idle the rest of the day, while the interest on capital would be going on just the same. With regard to the Widnes gas plant, he claimed that it was efficient in construction and economical to work. Some of his compeers might be inclined to say, after reading the report of that day's proceedings: "Mr. Carr claims to be in the van among gas managers, yet there is no account of gas stoking machinery, no record of water-gas plant, inclined retorts, &c." Well, they all knew it was modern practice to substitute, wherever possible, machinery for manual labour; and he agreed that when this could be done, all manufacturers should perforce avail themselves of it. But he regretted to say that, in the gas industry at the present time, it was the practice to substitute machinery and other apparatus for manual labour, with the sole object of disposing of workmen. In this respect he was at variance with many of his compeers. It was a pleasure to him personally to employ men, as well as a duty; and when he could engage men to do work, without encroaching upon economical ground, he thought that, besides performing a duty, he was doing a general good to everyone concerned. Their cost of production was 1s. 3d. per 1000 cubic feet; and he would like to know of the works operated by machinery, with water gas, inclined retorts, &c., where gas was being produced at a less cost. In conclusion, after remarking that the extensions had occupied nine months, Mr. Carr said that in carrying out this undertaking he had to acknowledge the energetic and untiring efforts of the whole of the staff in connection with the works. Other toasts followed, and the proceedings then closed.

AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Tuesday, at the Westminster Palace Hotel—Mr. J. H. Sheldrake in the chair.

The Secretary (Mr. W. G. Clements) having read the notice convening the meeting,

The Chairman opened the proceedings by referring to the loss the Company had sustained by the death of their late Chairman, Mr. A. Themson, who had rendered great assistance. Passing on to speak of

the accounts, he said that, though they showed loss, he thought the shareholders must admit that the report was the best the Directors had been able to put before them, considering their present position. After dealing with some of the items in the accounts, he dwelt at length with the proceedings taken by the Company against the Salford Corporation for infringing their patent. Though the effect of this action was to entirely stop their business for two years, its ultimate result was a judgment of very great importance for the future of the Company; for not only did the defendants lose in the Lower Court, but when the case was taken to the Court of Appeal, it was dismissed with costs. After the judgment was given, they were approached by the South Metropolitan Gas Company with the view of having some inclined retorts put up at their works, at one of which they would be open to the inspection of engineers. The policy of the Board in regard to charging so high a royalty had been criticized. He himself had always felt that the charge was heavy. The Board had reduced it 25 per cent.; and events were showing that this decision was the right one. There were in course of erection and in contemplation installations representing 2400 inclined retorts, the royalty upon which would amount to a large sum. The concern was now standing upon a footing it had never before occupied. The importance of the invention was being recognized; and he thought they ought to have a dividend-paying period before them. Of course, the costs of the trial had been a serious matter; but they had been paid, and the Company would start the New Year without any liabilities in this respect. The effect of the action had been to increase the value of their shares to a very appreciable extent. He concluded by moving the adoption of the report and accounts.

Mr. A. Kitt, in seconding the motion, said there was an absolute saving of 1s. 6d. per ton by the Company's system; and gas companies were thoroughly alive to this fact. The Directors would have to make a strenuous effort—they had a good case—to renew the patents.

Mr. Jordain asked what would be the result if the Company did not get an extension.

The Chairman said, as they were advised, they were almost certain to get it. But supposing they did not, they would not charge royalties; and the question was whether they should not then do their own construction. If they were at present in a position to construct their retorts, they would be specialists in the business, and after the patents had lapsed they would have a commercial undertaking at their fingers' ends.

The motion was carried unanimously.

On the proposition of Mr. B. T. Thomson, seconded by Mr. Gardner, Mr. Sheldrake was unanimously re-elected Chairman of the Company.

PUBLIC LIGHTING BY INCANDESCENT GAS-BURNERS AT ADELAIDE.

A few months ago, the attention of the Directors of the South Australian Gas Company was called to the fact that verbal offers had been made to the City Council of Adelaide for lighting the streets with electric arc and incandescent lamps of so-called 2000 and 50 candle power respectively. They thereupon, through their Secretary (Mr. J. Evans), pointed out to the Council that these were merely nominal candle powers; and that, as admitted by persons who had had experience of the system, in actual working the figures were found to be more like 500 and 15. They set forth the superior lighting power of the incandescent gas system for street illumination, as recognized by the authorities in London, Paris, Berlin, Sydney, and other large cities. Moreover, a comparison of the two lights could, they said, be made at a combined installation in the city. The councillors were evidently satisfied as to the worth of the system advocated, for at their meeting on the 8th ult. they sanctioned a public lighting contract with the Gas Company for five years, from Sept. 1 last; the installation to consist of 881 Welsbach burners at £4 10s. per light, and 46 extra burners at £3 each (a total of £4102 10s. per annum)—the lamps to be lit all and every night. On the following day the offer was made to the Company, and was subsequently accepted by them. Under the new arrangement, the Company sustain a loss by the cancellation of their existing lighting contract; and they bear the expense (about £1000) of providing and fixing new burners, mantles, chimneys, &c., and the additional cost for their maintenance and renewal, amounting to £300 or £400 per annum. The light furnished will be increased three or four times; and the lamps will be burning more than one-third more hours without raising the present lighting account, which is £4630 8s. per annum.

GAS AND GAS-METERS IN GREATER NEW YORK.

Our contemporary "Engineering Record" recently called attention to some features of the provisions of the New Charter which has been granted to Greater New York, more especially those bearing upon the inspection of gas and gas-meters. It is remarked that the Charter is tentative in its character, and will be subject to such amendment as experience may suggest to be desirable.

According to section 578, "the illuminating gas of every Company shall be inspected at least twice a year, and may be inspected as frequently as the Commissioner may think best, but not oftener than once a week." The standard of illuminating power is fixed at 20 candles, and a fine of $100 is to be imposed whenever it is found on three consecutive inspections to be below this standard. The requirements of this section are all in favour of the Gas Companies. The standard is low, the inspections are infrequent, and the fine is small. The average illuminating power of the gas supplied on Manhattan Island at present is not far from 25 candles; and it is claimed that gas supplied in Brooklyn is about the same. A reduction of four or five candles in the quality of the gas could therefore be made by the Companies without falling below the standard. It is very possible that no great reduction would be made. But it could be done if the Companies were so disposed; and our contemporary thinks it is folly to establish a standard with any idea that the quality of the article affected is to be maintained 20 per cent. above it. Should the Companies reduce the illuminating power to the extent allowable by this section, it is quite believed there would be frequent complaints from the consumers. At present daily tests (Sundays excepted) are made by the Department of Public Works of the illuminating power of all gases supplied on Manhattan Island; while it is understood that the gas supplied in Brooklyn is tested only at long intervals, if at all. After next month, tests are to be made not oftener than once a week. The case of London is cited as evidence that daily tests are not excessive.

Another interesting feature of the Charter is contained in section 575, which provides that all meters for measuring gas, electricity, or steam shall be tested within a year from the 1st prox. Provision is also made for the testing of all new meters which may be put into use in the future. It is remarked that this idea is a good one; but those who framed the section probably had no knowledge of the amount of labour involved in meter-testing. Taking gas-meters alone, there are probably in Greater New York at least 500,000. An expert meter-tester is doing good work in proving 200 meters a week, and this for their measuring capacity alone, and not for their tightness. At this rate, it would require the services of about fifty meter-testers and as many sets of testing apparatus to do the work required within a year. It is very doubtful if the City could find fifty persons properly qualified to test meters; and certainly most of the apparatus would have to be constructed. The salaries of the meter-testers would naturally be paid by the City; but all the apparatus must be furnished by the Gas Companies. After this wholesale meter-testing had once been gone through, most of the testers and the bulk of the apparatus would no longer be required, as a comparatively small force could handle the testing of new and repaired meters. Our contemporary thinks that probably most gas consumers are satisfied with the meters they are now using; and it would therefore be an unnecessary task to test them. The object desired would be amply attained if provision were made for the testing and sealing of new and repaired meters, and such others as might be sent in from time to time by dissatisfied consumers.

THE GASLIGHT AND COKE COMPANY'S CAPITAL CONVERSION SCHEME.

In compliance with Standing Orders, the Bill promoted by The Gaslight and Coke Company to obtain the sanction of Parliament to the carrying out of a scheme for the conversion of their capital has been deposited in the Private Bill Office of the House of Commons. We have already indicated the scope of the Bill, but are now able to give some additional particulars.

The preamble sets forth that the Company was originally incorporated by Royal Charter on April 30, 1812, under the authority of 50 Geo. III., cap. 163. Further powers were granted by subsequent Acts; and the Company was finally incorporated in perpetuity by the 59 Geo. III., cap. 20. By an Act obtained in 1868, all the previous Acts were repealed and their provisions were consolidated. The various Acts affecting the Company are set out in a schedule to the Bill. Under Orders in Council confirming schemes made under the City of London Gas Act, 1868, and the Company's Act of 1871, amalgamations were effected with the City of London, Great Central, Western, Imperial, and London Companies; and by two Acts obtained in 1870 and 1871, the undertakings of the Victoria Docks and Equitable Companies were acquired. The present capital and debenture stocks, issued and unissued, together with the dividends to which they are entitled are tabulated in schedules. The preamble concludes by stating that it is expedient that these stocks should be respectively consolidated and converted in the manner set forth.

Coming to the clauses, the short title of the proposed Act is to be "The Gaslight and Coke Company's (Capital Consolidation) Act 1898;" and it and the Company's other Acts are to be construed as one, and cited collectively as "The Gaslight and Coke Company's Acts, 1868 to 1898." The "A" 5 per cent. preference stocks (fourth and fifth issues), the "B" maximum stock, and the "C," "D," "E," "F," "G," "J," and "K" preference stocks are referred to collectively as "the Company's existing preference stocks;" and as from Jan. 1, 1899, they are to be consolidated and converted into a 4 per cent. preference stock. These stocks amount together to £1,806,590; and they are to be converted into one stock of the amount of £3,799,737 10s. Holders of the "A" and "F" stocks (5 per cent.) are to receive £125 for each £100 of stock; holders of "B" will be unaffected; holders of "C," "D," "E," and "J" stocks (10 per cent.) will receive £250 for each £100 of stock; holders of "G" stock (7½ per cent.), £187 10s.; and holders of "K" stock (6 per cent.) £150. These stocks are to take priority of all the stocks of the Company for the time being other than the debenture stock and the "A" 5 per cent. preference stocks (first, second, and third issues). The "H" maximum (7 per cent.) stock, amounting to £1,300,000, is to be converted into £2,600,000 of 3½ per cent. maximum stock; each holder receiving £200 of the new stock for each £100 of that now existing. The "A" ordinary stock, amounting to £5,922,110, is to be converted into £14,805,275 of ordinary stock, in the proportion of £250 for each £100. The Company's existing power to create and issue "A" stock to the amount of £175,000 is to be raised so that they may create £437,500 of ordinary stock; but, except to the extent here provided for, nothing in the Bill is to be construed as authorizing any increase of the nominal share capital of the Company. It is provided that the Company shall, rateably with and after the issue of any part of the £437,500 of ordinary stock, from time to time, before issuing any further ordinary stock, issue such quantity of their unissued 3 per cent. consolidated debenture stock of £350,000 (referred to below) that the nominal amount of 3 per cent. debenture stock issued after the passing of the Bill is equal to four-fifths of the nominal amount of ordinary stock theretofore issued; and the Company are not at any time after the first issue of such ordinary stock after the passing of the Bill, to issue any further amount of ordinary stock until they have obtained from a Justice of the Peace a certificate that they have issued the above-named amount of debenture stock; and on the production to him of the books of the Company, and of such other evidence as may be necessary, he is to give such certificate. The Company's existing debenture stocks, amounting to £2,364,000, are to be

converted into one 3 per cent. debenture stock of the amount of £3,843,975. Holders of the existing 4 per cent. debenture stock will have £133⅓ for each £100; holders of 4½ per cent. stock, £141⅔; holders of 4½ per cent. stocks, £150; and holders of 6 per cent. stock, £200. The Company's existing power to create debenture stock to the amount of £175,000 is to be raised so that they may create £350,000 of the new 3 per cent. stock, to be issued rateably with, but after the unissued £437,500 of ordinary stock already referred to. The total amount of the future preference, maximum, and ordinary stocks will be £21,642,812 10s.; and of debenture stock, £4,193,975. The new stocks are to be issued and transferable only in amounts of £5 and multiples thereof; and provision is made for dealing with smaller fractions of stock. Trustees may invest in the 4 per cent. preference and the debenture stock. Holders of the 5 per cent. preference stock (first, second, and third issues) are to have the option of converting it into ordinary stock. The initial rate of dividend of 4 per cent. per annum is to increase or decrease at the rate of 2s. for each 1d., or fractional part thereof, by which the price of gas varies downwards or upwards from the standard of 3s. 9d. per 1000 feet.

The remaining clauses of the Bill deal with the application of the net profits after providing for dividends on the preference stocks; the qualifications of Directors and Auditors; the charging of the expenses of the Act; and the repeal of inconsistent provisions. It is specified that the Company's insurance fund is not to be increased beyond £460,200.

THE PROPOSED AMALGAMATION OF THE REDHILL AND REIGATE GAS COMPANIES.

The above-named Companies will both be in Parliament next year—the former to obtain additional powers, including authority to acquire the undertaking of the Reigate Gas Company, Limited; the latter for powers of incorporation. It is proposed that the transfer shall take place on Sept. 29, 1898, by a deed of conveyance; and the Redhill Company will take over the whole of the property, except the balance of the reserve fund, after the payment of the sum of £1000 to the Redhill Company, and all the investments, cash in hand or at the banker's (not being attributable to capital account), and debts and moneys due and owing up to the transfer day. If the Reigate Company have not, as from June 30, 1897, up to the above-named date, expended out of revenue towards maintaining their works and plant a sum calculated at the rate of £400 per annum, they are to pay to the Redhill Company, in addition to the £1000, a sum equal to the amount by which their expenditure out of revenue on such purposes for the above period has fallen short of the rate named. The Reigate Company are not to create any further capital beyond the £20,000 of ordinary stock existing on the 30th of June, 1897. As from the date of the transfer, the Redhill Company will, except as expressly provided, assume all the obligations of the Reigate Company. With regard to the officers, the Reigate Company are to give their Engineer and Manager proper notice to terminate his appointment; and he is to receive compensation for loss of office. The present Secretary of the Company, as well as the Works Manager, is to be employed for not less than three years from the date of the transfer. The shareholders of the Reigate Company are to receive £35,000 (nominal value) of new ordinary stock of the Redhill Company entitled to a dividend of 7 per cent. per annum; and as soon as conveniently may be after the transfer, the affairs of the former Company are to be wound up. Two of the Directors of the Reigate Company are to be qualified as Directors of the Redhill Company; and the persons appointed will come into office on the date of the transfer. On the occurrence of the first casual vacancy, these Directors may nominate one of their former colleagues to be associated with them on the Board. The capital is to be consolidated, and bear a standard rate of dividend of 5 per cent.; and new capital to the amount, including premiums, of £52,000, and such further sum as may be required for the purchase of the Reigate Company's undertaking, will be applied for. The name of the Amalgamated Company is to be the Redhill and Reigate Gas Company.

THE ELECTRIC LIGHTING SCHEME OF THE TOTTENHAM AND EDMONTON GAS COMPANY.

Our readers may remember that in the epitome of the various notices of proposed applications to Parliament next session which appeared in the "JOURNAL" for the 30th ult. it was mentioned that the Tottenham and Edmonton Gas Company intend, among other things, to seek electric lighting powers. The Bill which has been deposited furnishes particulars of the scheme.

The Act to be applied for will deal with the Company's capital, which it is proposed to convert and consolidate; but this matter may be left for a future occasion. The portion of the Bill relating to electric lighting starts with clause 26, which incorporates the Electric Lighting Acts of 1882 and 1888. The various terms used in these Acts are, of course, to have the same meanings in the Tottenham Act. The Company seek power to acquire land and provide buildings and plant for the production and supply of energy within their gas limits; but before undertaking this work they must satisfy the Board of Trade that they are in a position to discharge the duties and obligations to be imposed upon them. The system under which the energy is to be supplied for public and private purposes is to have the approval of the Board; and no wires are to be placed above ground, except where absolutely necessary for the service, without the express consent of the Board and the Local Authority. No earth connection is to be made without the approval of the Board and the concurrence of the Postmaster-General. Street-boxes are to be placed underground, and are to be so constructed and maintained as not to be a source of danger. The Local Authority may, with the approval of the Board of Trade, prescribe the hours during which the Company may have access to the boxes; and the latter will be liable to a penalty if they interfere with them without the necessary consent, unless in case of emergency. Notice of works to be carried out in the public thoroughfares is to be sent, with a plan, to the Local Authority and the Postmaster-General; and if they do not intimate to the contrary within a month, they are to be deemed to have approved of the proposed works. Provisions are included for the protection of the Postmaster-General, telegraphic and telephone wires, and railway and gas and water companies. The Company are not to interfere with any main, pipe, or other work, belonging to one of the last-named companies, in a way which does not meet their approval. The Company undertake, within a period of two years after the commencement of the Act to be applied for, to lay down suitable and sufficient mains for the purposes of the general supply of electric energy throughout High Street, Tottenham, and the Green Lanes, or such part thereof as they may be agreed upon with the Local Authority; and if they fail to do so, their powers will cease. They are to supply owners and occupiers of premises within 50 yards of their mains, under conditions, both as regards suppliers and consumers, which are fully set forth. The Local Authority may require the Company to furnish a supply of energy to any public lamp within 75 yards of a main which they have to keep charged. The penalty for failure to supply any consumer or public lamp is not to exceed 40s. for each day on which the default occurs. But the penalties are not to amount to more than £50 a day if the defaults are not wilful; and they may not be imposed at all. The Company may charge by the actual amount of energy supplied, by the electrical quantity contained in the supply, or by such other method as may be approved by the Board of Trade. The price under the first system is to be 13s. 4d. for any quantity up to 20 units, and 8d. for each additional unit; under the second, they are to charge according to the above rates—the amount of energy supplied being taken to be the product of the electrical quantity and the declared pressure at the consumer's terminals. Other charges, including those for public lighting, are to be subject to agreement. The Company are to be liable to heavy penalties, or even a revocation of their Act, if they fail to comply with orders of the Board of Trade.

ELECTRIC LIGHTING NOTES.

In the course of a lecture at the Kingston Literary Society on "Electrical Inventions during the Queen's Reign," Professor J. A. Fleming, M.A., D.Sc., F.R.S., stated, as showing the wonderful growth of electric lighting in this country, that in 1890 there were only 100,000 incandescent lamps installed in London; while a year later the number had doubled, and in 1896 there were 1,400,000 lamps in the Metropolis, and 1,600,000 in the Provinces. The whole of this was practically the growth of seven years. There were now, he said, 140 electric lighting stations in this country; and he thought in a very few years the wisdom of those local authorities who had kept the works in their own hands would be abundantly demonstrated.

Last Wednesday, Colonel W. L. Coke, one of the Inspectors of the Local Government Board, held an inquiry at Salford with reference to an application of the Corporation for power to borrow £13,000 for electric lighting purposes. The Town Clerk (Mr. Brown) explained that £44,770 had already been expended by the Corporation on the electric lighting undertaking; and it was now intended to construct a battery sub-station under the Regent Road Public Baths. A number of accumulators would be placed in the cellars of the baths, and the electrical energy stored there, so as to provide for four hours' consumption of electricity at the present rate. The mains would be extended, and certain other improvements would be effected in connection with the undertaking, so as to meet the public demand.

The application of the Carlisle Corporation for the permission of the Local Government Board to the borrowing of £30,000 for laying down electric lighting works was the subject of an inquiry by Colonel Durnford last Tuesday. Professor Kennedy (the Consulting Engineer) described the scheme, and stated that the Corporation would themselves put up the arc lamps in the streets, but would not supply lamps for private purposes. They would only take the mains to the doors of their customers. In reply to the Inspector, the Town Clerk stated that a number of people were ready to adopt the light, and that the Corporation would also use it in the public buildings. The estimated amount to be expended was about £26,300; and this would leave a balance of £3700 for contingencies, extension of mains, and road work.

A Bill has been deposited for next session, the preamble of which sets out that great difficulty is experienced by electric lighting companies and local authorities who supply electricity in providing sufficient electrical energy to enable them to meet the demands of consumers at certain times of the day, while the production by each separate company and local authority of sufficient energy to meet the maximum demands involves the expenditure of large sums of practically unproductive capital, and results in the consequent enhancement of the price that has to be paid for the electric light. To surmount these difficulties, the Bill proposes to confer on a Company power to erect generating stations at one central spot in Marylebone, on the banks of the Regent's Canal, and from this point to supply electrical energy in bulk to any "company, body, or person," at such price and on such terms as may be agreed.

An animated discussion took place at the meeting of the Sheffield City Council on Tuesday on the subject of the purchase by the Corporation of the undertaking of the Electric Light Company. The Council were called together to confirm a resolution giving power to their Parliamentary Committee to apply to the Local Government Board for a Provisional Order amending so much of the Provisional Orders Confirmation (No. 9) Act, 1892, as would enable the Corporation to issue irredeemable stock to an amount sufficient to purchase the electric light undertaking, and to authorize the issue of redeemable stock sufficient to pay certain money as interest on amounts expended by the Company. An appeal was made by the Chairman of the Parliamentary Committee (Mr. H. W. Chambers) that the Council should not enter into any discussion on the matter at this period of the negotiations; promising that a full opportunity for discussion should be given at an early date. Sir Charles Skelton said, while he did not wish to hamper the Parliamentary Committee, he could not forget that six months ago a similar request was made to them, with the result that they were landed in a very awkward position. At one time they could have had an agreement signed and everything settled. Were the Parliamentary Committee now in earnest, or were they simply playing with the Council, as they had done before? It was a great shame that the money of the ratepayers should be wasted in the infamous way it was. Several members of the Corporation protested against the language used

by Sir Charles Skelton, while others expressed their determination to vote against the resolution unless the position of affairs was explained to them. Mr. Chambers promised that at the earliest possible moment full discussion should be allowed; and the resolution was carried by 31 votes to 9—seven members remaining neutral. It is stated that the Electric Light Company intend shortly to call up more capital, and to continue to conduct their business as though the Corporation were not in the field as purchasers.

The Recorder of Dublin had before him last Tuesday the action brought by Charles Thorpe against the Dublin Corporation to recover damages for injuries sustained through the alleged negligence of the defendants in the control of their electric lighting system. It may be remembered that the case was remitted to the Recorder from the Queen's Bench Division; and the facts have already been stated in previous issues of the "JOURNAL." Briefly, the plaintiff's case was that on Oct. 30 last, while in Grafton Street, he stepped on an iron plate at the foot of an electric lamp-post, and immediately received a terrible shock, which threw him on the pavement. He felt as if he had been struck by hundreds of needles, was unable to close his mouth, and was made to dance about. A person who came to his assistance also received a shock. Plaintiff had not yet recovered from the effects of the occurrence. For the Corporation, it was admitted that something was wrong with the electric light on the night in question; but evidence was given that no injuries were received by plaintiff, though he might have sustained a shock. Professor Barrett, examined for the defendants, stated that he had studied this case and the system of electricity laid down; and, in his opinion, it was incredible and inconceivable that any injury could be caused by the conditions existing at the time of the alleged occurrence, assuming that the Board of Trade regulations were at the time carried out. It was incredible that one man catching another who stood on this plate could have been affected by an electric shock. Darling, one of the plaintiff's witnesses, was recalled, and said he felt the shock on the footpath, and that he lost his senses, and was thrown out into the street. Another man who touched the plaintiff, thinking he had an epileptic fit, also received a severe shock. The Recorder, in giving his decision, said he felt certain that, if this case was before a jury, they would find without hesitation against the defendants; for they would hold that the Corporation had not done all that they should have done, or might have done, to keep the electric current and machinery under proper control. It was a mercy the plaintiff was not killed. It was dramatically one of the most remarkable incidents that had occurred in the city. He was told that what had been deposed to was impossible. He did not care a fig for what scientists might say in view of proved and certain facts. He did not, however, believe that the plaintiff was much injured; but he was convinced he did receive a shock, followed by nervous excitement. In conclusion, he considered that the plaintiff would be fairly treated if he made a decree for £20, and £5 for medical attendance.

THE LONDON COUNTY COUNCIL AND THE THAMES CONSERVANCY.

The Alleged Pollution of the River.

At the Meeting of the London County Council last Tuesday, the General Purposes Committee submitted the report on the above subject referred to in our article on "Water and Sanitary Affairs" last week. It contained a long correspondence which had passed between the Council and the Thames Conservancy Board on the subject of certain statements made by Mr. Idris, who is one of the Council's representatives on the Conservancy Board, with reference to the action of the Conservancy in regard to the purification of the River Thames. At the meeting of the Council on Oct. 12 last, Mr. Idris made the following statement: "That the Thames Conservancy Board is controlled or influenced very largely by people interested in land in the Thames Valley, who feel that it is unjust that they should be compelled at their own cost to purify the effluents in order that they may provide drinking water for London." The Conservancy Board wrote denying the accuracy of this statement, and pointing out that the constitution of the Board was not such as to lend itself in any way to the charge made by Mr. Idris. Exception was also taken to certain statements made by Mr. Idris to the effect that the refuse of London was constantly being taken up and down the river in the most leaky and rotten barges to be obtained, and that the water which found its way into these barges was constantly being pumped into the river. The Conservancy replied that during the present year there had only been one case (a quite recent one) where it was reported that refuse of a foul character was being carried on the part of the river above Teddington; and, though it since appeared that the refuse was only ashes, immediate steps were taken for the removal of the barge before any harm could have arisen from its presence. Mr. Idris, at the request of the General Purposes Committee, drew up a communication in which he justified his statements. In a letter dated the 6th inst., the Conservancy Board somewhat modified their remarks with reference to the barge in question—pointing out that they had been misled by one of their inspectors in stating that the barge contained ashes only, and that the expression "ashes only" was meant to include "house refuse." In the course of the correspondence, the Council asked for certain documents, which were refused by the Board. The General Purposes Committee now recommended that a copy of the letter of Mr. Idris should be forwarded to the Thames Conservancy Board, with an expression of regret that the Conservators declined to furnish the information asked for. The Chairman of the Committee (Mr. Beachcroft) dissented from the recommendation, and therefore declined to move it. Its adoption was accordingly proposed by Mr. M'Kinnon Wood, who said the subject was one which concerned the Council; and he held that it was their duty to take action, and not to regard the matter as a personal one between Mr. Idris and the Board. It was a question of maintaining the purity of the river, the water of which was drunk by a very large proportion of the inhabitants of London. Mr. H. P. Harris contended, on the other hand, that the dispute was a purely personal one; and, in order to close it, he moved, as an amendment, that the Council should proceed to the next business. Lord Dunraven seconded the amendment; but, on a division, it was rejected by 48 votes to 41. After some further discussion, the recommendation was agreed to on a show of hands. The Committee next recommended the Council to pass a resolution expressing its "unabated confidence in Mr. Idris as one of its representatives on the Thames Conservancy Board." An amendment was proposed to add the names of the other representatives of the Council on the Board; but the debate thereon was closured, and, on a division, the amendment was rejected by a majority of 8. The recommendation having been agreed to, a further one was submitted expressing the opinion of the Council that "it is desirable that publicity should be given to the proceedings of a Board entrusted with a matter of such vital public interest as the purification of the River Thames." An amendment to proceed to the next business was rejected; and the recommendation was finally agreed to.

WATER SUPPLY AND EPIDEMICS.

The Local Government Board have lately issued the following circular-letter to the Clerks of Town Councils and other authorities, on the subject of the supply of water in districts which are not within the imits of Water Companies:—

The importance of a wholesome supply of water need not be emphasized, in view of the serious epidemics of enteric fever which have of recent years been brought about by specific contamination of water supplies in different parts of the country. It is true that this disease, which formerly prevailed somewhat generally in endemic form, has during the last twenty-five years been largely reduced as a cause of death. But, on the other hand, there is now a recurring tendency to sudden localized epidemics, in which the typhoid infection is distributed to large populations by means of the contamination of water delivered from public works of water supply.

The Council are the body responsible under the Public Health Acts for securing to the inhabitants of their district a proper and sufficient supply of water; and the Board desire to impress upon them the importance of taking the matter into their serious consideration, with the object of guarding their district against dangers the gravity of which has been sufficiently shown by recent examples.

Where the Council have themselves constructed or purchased any water-works, it is their duty, in pursuance of section 55 of the Public Health Act, 1875, to provide a supply of "pure and wholesome" water; and in order to fulfil this obligation, it behoves them to exercise every precaution to secure that the water which they deliver to the consumers shall be protected from risk of contamination, whether in connection with the sources from which it is derived or during the course of its storage or distribution, and that where means of filtration are necessary these should be adequate, and maintained in a thoroughly efficient condition. Not only are the Council thus under a responsibility for the wholesomeness of the water which they themselves supply, but they should, by careful inquiry, make themselves acquainted with the sources, nature, and quality of the various supplies in all parts of their district, and, in every case in which the result of their inquiries is unsatisfactory, should take all such steps as may be within their powers with the view of supplementing or improving the supplies.

The Board would observe generally that accurate information should be procured, if not already available, in such matters as the following: (1) Where water is derived from gathering-grounds or from springs, whether drainage from human habitations, farmyards, and the like, finds its way, directly or indirectly, into the reservoir or to any part of the water service; and whether risk of access to the water of human excreta and similar refuse is likely to arise. (2) Where water is derived from deep wells, whether surface or other water, liable to be contaminated by drains, sewers, cesspools, and the like, reaches, or is liable to reach, the wells. The existence and direction of fissures in the strata deserve especial consideration in this respect. (3) Where water is derived from shallow wells, whether the wells are so circumstanced that they run risk of contamination by reason of drains, privies, cesspools, or middens, or by deposit of manure (whether derived from human excreta or not) in or on the ground in the neighbourhood of the wells.

The Board trust that the Council will not fail to give their most careful attention to this subject, and that, where it may appear that further works which may be within the powers of the Council for the improvement or protection of existing supplies are needed, the Council will forthwith, with the assistance of such skilled advice as the circumstances of the case may require, execute the necessary works.

THE FIGHT FOR THE TODMORDEN WATER-WORKS.

The Rochdale Bill Rejected at a Town's Meeting.

A Meeting of the property owners and ratepayers of Rochdale was held yesterday week to consider the recommendation of the Town Council that they should promote a Bill for the purchase of the Todmorden Water Company's reservoir, to acquire additional sources of water supply, and construct new water-works, and, further, to consider whether they should oppose the Todmorden Corporation Bill, having for its object the acquisition of the same reservoir and rights. The Mayor (Mr. Ashworth) presided; and, in moving the first resolution, he quoted a number of figures to show the necessity for securing a further supply of water. Alderman W. T. Heap, as Chairman of the Water Committee, seconded the motion. They all knew, he remarked, that the extraordinary cost of the Cowm and Spring Mill reservoirs had entailed heavy charges on the rates of the town. The deficiency on the Water Department in 1886 was £16,600; but he was pleased to say that the increased consumption, and consequently the increase of income, had greatly reduced the amount, which last year stood at less than £4000. This large growth of income meant, of course, a considerable increase in the consumption of water; and the reserve of the present supply was so near being fully utilized that the Water Committee deemed it necessary to secure fresh sources of supply. The scheme recommended was considered to be the best available; and if the necessary parliamentary powers were obtained, it was intended that the various works should be constructed as required. The provisional

arrangements made for the acquisition of the Todmorden Water Company's undertaking were considered to be absolutely necessary in order to utilize to the best advantage the water supplies of the district. Mr. Howarth, a member of the Town Council, opposed the scheme. He thought the existing reservoirs were capable of supplying the town for a considerable length of time under present circumstances. They had a total capacity of 503 million gallons, which was equal, with compensation water, to 167 days' supply. If it was necessary they should have more water, he would advocate the raising of the bank of Spring Mill reservoir. There were several other speakers both favourable and antagonistic to the proposed purchase; and, on the resolution being put to the vote, it was negatived by a large majority. On behalf of the Water Committee, Alderman Heap demanded a poll. The second resolution consenting to the opposition to the Todmorden Bill was declared carried.

Commenting upon the result of the above meeting, the "Rochdale Observer" remarks: "It would be monstrous to allow a snatch vote to deprive the town of extensions of water supply ample enough for all the possible requirements of the district for many years to come. That opportunity is not yet lost. We have confidence that the poll will show that the ratepayers desire the Council to seize it, and make the best of it."

THE ADDITIONAL WATER-WORKS FOR NEW YORK.

The Construction of the Jerome Park Reservoir.

Our readers may remember that the extensive system of water-works now being carried out for New York City comprises the construction of a new Croton aqueduct and a large storage reservoir in Jerome Park, on high ground within the limits of Greater New York. Particulars of these important undertakings have been given at various times in the "Engineering Record;" and we take the following from those which have recently appeared. The reservoir is intended to be finished in 1902, and will cover a total area of 299 acres. It is to be used for storage and distribution, to supplement the present reservoirs in Central Park. It will have a division wall separating it into two independent sections, and will have a total capacity of 1500 million gallons. A branch conduit a mile long is to be built to connect it with the new Croton aqueduct. Altogether, upwards of 300,000 cubic yards of masonry of all kinds will be required. The reservoir will be largely in excavation, and where embankments occur they will contain a core wall of masonry. There will be about 3,500,000 yards each of earth and rock excavation. The work embraced in the construction of the reservoir and its appurtenances is being executed for a total contract price of about $6,000,000. If 86 c. per cubic yard is allowed for the excavation of the rock, and 23½ c. for the earth, there remains nearly half the sum as payment for the actual construction involved; including about 500,000 yards of embankment and several thousand feet of new roads outside the reservoir limits.

The natural surface of the reservoir site was very irregular, comprising many knolls and hollows, and some small hills of considerable magnitude. It was covered generally to an average depth of perhaps 5 feet with loose earth, sand, and gravel, below which the rock is generally of gneiss, although at the south end some granite is encountered. The stratification of the gneiss is exceedingly irregular; and the layers are to be found in almost every position, dipping at widely different angles. Excavation is necessary over nearly or quite the entire area of the reservoir, and is from 12 to 65 feet in depth. Embankments are required round the entire outer walls of the reservoir, even where it is largely in cut; and, except in the latter case, they are provided with core walls of heavy rubble masonry, 3 feet wide on the top, and carried down to sound rock, and into the flanks of the hills they intersect.

The reservoir is about one mile in length and half a mile in width; the outline being a somewhat regular oblong, modified by the contours of the ground, except at the southern extremity, where there is a projection about 300 feet wide and 400 feet long. The surface is mapped in thirteen different sections, each of which shows contours every foot. Stations are also established, from which cross-sections are taken transverse to the longest diameter of the reservoir, only 10 feet apart, upon which profiles are plotted and progress recorded every month, thus establishing a very minute estimate of the work accomplished.

The plan of conducting the excavation is very simple, and consists merely in removing as much of the earth as can be conveniently excavated by steam-shovels, and then starting long lines of rock-cut, which are carried down at once to grade and across the reservoir until its limits are reached. The materials are handled entirely by mast and boom derricks and standard platform cars drawn by locomotives; it being intended to supply all the power eventually from a central plant, and transmit it by a system of compressed-air pipes. All the excavated material, except what is needed in the construction of embankments and masonry, is immediately hauled to dumping-grounds about four miles away, and is sold for filling in and grading. Two ¾-yard Barnhardt steam-shovels are in service, averaging about 650 yards a day, and digging a trench 34 feet wide down to the surface of the rock, on which the machine stands and delivers to cars on the spoil-track alongside.

Two rock-cuts are being made. They have long, straight faces, upon which numerous gangs of men are at work digging, blasting, and loading with derricks, upon trains of spoil-cars that run on standard gauge tracks laid as close to the face as possible, being advanced parallel to it as fast as the face recedes. One cutting is about 800 feet long, and served by eight large derricks. The surface of the ground is so irregular that steam-shovel work upon it is not considered practicable; and the earth is stripped by shovel gangs, who load it into 2-yard skips emptied by the derricks on to the cars. Three-inch holes, some of them 20 feet deep, are then drilled vertically in the top of the rock about 6 feet back and 6 feet apart; and corresponding horizontal holes are drilled in from the face towards the bottoms of the vertical holes. The horizontal holes are fired first, and afterwards the vertical ones. Although theoretically they should be fired simultaneously, it is found more convenient to follow the plan mentioned, on account of practical reasons. If the depth of the cut exceeds 20 feet, the material is taken out in two benches; otherwise the excavation is carried to grade at one operation. About 600 lbs. of 40 per cent. dynamite are used daily; and the rock is broken up in very irregular masses, which are again blasted in case they exceed 3-yard pieces. All is loaded separately or mixed with earth, as the case may happen to be. About 30 minutes are required to load an eight-car train, and 40 minutes more to make the round trip to the dump and back. Each train of loaded cars is supplied with an unloading engine and plough, which scrapes off the entire load from one side of the car in the manner usual in railroad work. The cars are provided with hinged steel plate flaps, which shut down horizontally, so as to bridge over the space between the cars; and short, heavy stakes are set in sockets as guides to retain the plough in position. About twelve dump trains are in service, transporting from 2500 to 3000 yards of spoil daily. Each car carries 12 yards of earth or 15 yards of rock. There are ten miles of standard gauge track laid with 60-lb. rails, comprising a double track from the reservoir to the dump; and four lines, each with the necessary sidings, that diverge from the main line inside the reservoir boundaries to the different rock cuttings and steam-shovels. There are 35 mast and boom derricks in service on different parts of the work, all of them having 70-feet masts and 68-feet booms, both tapered from 14 inches square to 12 inches square, and furnished with standard fittings, except at the foot of the mast, where a special set of castings is inserted between the ordinary heel-block and the base-plate, so as to give a roller bearing of ½-inch hardened steel balls. Each derrick is independently guyed by five 1½-inch steel cables taken to separate anchorages. It is rigged with a ¾-inch steel running rope, and has a capacity of 6 tons. Each derrick is operated by an independent 20-horse power double-drum and double-cylinder hoisting-engine, all fitted to use compressed air. There are 32 Ingersoll drills in use, 16 of which are run by compressed air at about 68 lbs. pressure, and the remainder by steam; four being operated from each portable boiler. There are ten large locomotives and 120 standard-gauge platform cars 34 feet long, used for hauling the spoil; besides 65 2½-yard side-tilting dump cars, and three small locomotives, all running on a 3-feet belt track 3 miles long for the distribution of material.

Besides the excavation, the principal work at present is the construction of the masonry core walls and the foundations of new sections of aqueduct; the trenches requiring pumping and sheet piling in some cases. The aqueduct foundations are very massive, and consist of one centre and two outside longitudinal heavy walls, with the two enclosed spaces arched over with brickwork, and filled in with loose stone; the top platform being built up solid above, and finished with concrete to the approximate surface required for the inverts of the parallel conduits. The stone for all the masonry is selected from the best pieces blasted out of the excavations, and is used without dressing or dimensioning. During frosty weather, the mortar is mixed with sand which has been warmed by heaping it up over steam-pipes; while the water used is heated by discharging exhaust steam into the barrels holding it.

The power-house is equipped with one 200 and one 250 horse power upright tubular boiler, controlled by an automatic damper regulator, operated by a variation of 2 lbs. in the steam pressure. There are feed-water pumps and a feed-water heater using exhaust steam. There is one 24 in. by 42 in. by 48 in. cross-compound Corliss air-compressor, with a 600-horse power engine, which delivers air at 80 lbs. pressure into a 9 ft. by 6 ft. receiver, supplied with drip-pips and safety-valve, from which it is distributed over the reservoir through an 8-inch steel pipe with 4-inch valved branches, each of which can supply six 2-inch drill connections. The pressure-pipes have dry valves, and accumulations of moisture are blown off every night. The air in the pipe is also reheated by means of an open fire about 4 feet long, built over the pipe close to the engine, or by passing it between the double walls of a small coal-stove similar to a water-heater. A mixture of coke and soft coal is found best for these open fires.

As the compressor described is adequate for the operation of only about 16 drills and 14 hoisting-engines, the remainder are driven at present by portable steam-boilers located at convenient points. These will soon be replaced by a new cross-compound Corliss air-compressor, with a 600-horse power engine, now being installed, which is provided with a compounding air system. A pressure of 60 lbs. is developed in the first cylinder, from which the air is delivered into a tubular condenser, where it is cooled. Then it is taken to a second cylinder, where the pressure is increased to 110 lbs.; and it is thence piped to a separate receiver, which will be cross-connected with the existing one.

Water from the city mains is stored in a 50,000-gallon earth reservoir, formed by an embankment adjacent to the power-house. The hot condensation water from the exhaust is caught in wood tanks, and pumped back through the feed-water heater for repeated use. A consumption of 6 tons of soft coal per day is at present required in the power-house, besides about 18 tons of coke for the locomotives, steam-shovels, re-heating of air-pipes, smith's forges, and other purposes.

In order to enable the contractors to remove the spoil from the excavations to the dumping-ground at a low grade, a cut has been made beneath the aqueduct, which crosses the reservoir, and the tracks allowed to run under it. The section of the aqueduct thus undermined has been replaced by a covered timber flume, in two spans of about 14 feet each, supported by masonry abutments and a centre pier. This flume is built of a double thickness of matched and tarred plank, which extends at both ends into the aqueduct masonry, where it is flared out so as to penetrate its walls at a small angle. The wedge-shaped portion of masonry thus removed from the interior of the aqueduct was built in after the planks were set in position; and a small cavity left at their ends was grouted full under pressure—giving a satisfactorily water-tight connection between the permanent masonry and the temporary timber section.

When the contractors took possession of the site, there were about 400,000 feet of standing timber upon it, all of which has been cut, for the purposes of the work, in a saw-mill erected near the power-house. It contains a band-saw, a rip-saw, and a planing-machine driven by a 20-horse power engine. The ordinary blacksmith, carpenter, and repair shops, with their tools, are provided; and one of the buildings standing on the site is about to be fitted for a complete machine-shop. The different tools here contained and the machinery previously described comprise the principal items of plant at present installed, except two sectional 2-ton rollers, for compacting the embankments. Each has nine rings of cast iron, mounted on the same axis, and arranged so as to give rings 2 inches wide and 3 inches deep, with spaces of 4½ inches between them—each section resembling a large flanged wheel.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Fog has set in this week, in a way which it does not often do in Scotland. There have been numerous instances of mishap in connection with it; but, so far as I learn, the only one having any connection with gas-works has taken place in Glasgow. A man and three boys left the Temple gas-works at Dawsholm on Wednesday afternoon; the man a little in front of the boys. The boys saw the man fall into the Forth and Clyde Canal, which at that place runs alongside the road; but in the condition of the atmosphere, they were unable to render him any assistance, and he was drowned.

The output of gas in Perth this year has been quite phenomenal; there having been an increase of 15 per cent. upon last year. As is well known, the Gas Commissioners are about to transfer their works to a new site; and in such a state of matters, it is only natural that they should not wish to add anything to the existing ones. The increase is, however, so great that the gas which is being sent out is not so well purified as it should be. At the last meeting of the Commission, one of the members gave notice of a motion to the effect that gas of an increased candle power should be sent out. In the opinion of this member, what was to be complained of in the gas was the illuminating power. This is not the case. It transpires that the firm of dyers, of which Sir Robert Pullar is the head, have found that there is too much sulphuric acid in the gas. The firm reported the matter to the Sanitary Inspector for the city, who made investigation, and found it to be the case that the gas was laden with sulphuric acid. As the result of the report of the Sanitary Inspector, a meeting of the Gas Commission was held on Monday, at which the subject was considered; and the following official account of the proceedings at the meeting has been given: "The meeting took into consideration the present extraordinary demand for gas, and the limited purifying and washing power at the present gas-works; also the report by the Sanitary Inspector on complaints he had received as to the offensive smell said to be rising from the gas supply. It also considered a report by the Gas Manager on this subject, wherein he explained that it was now past the period of the year when a great pressure was required, and that there was already a reduction in the make of 70,000 cubic feet per 24 hours. He anticipated that he would be able to keep the purification within reasonable bounds; and he hoped that the new gas-works would be in operation before so great a supply of gas was required at this time next year. Mr. Wilson, who was present, further explained that if the demand did not diminish, the only thing that could be done with the present plant was to reduce the pressure. Mr. Wilson's explanations were considered satisfactory by the meeting; and he was authorized, in the event of the demand for gas exceeding the purifying powers, to act upon the suggestion he had made." This is satisfactory, because the public might be fomented into thinking something was wrong in the gas supply; but now, with the frank admission of Mr. Wilson, adopted by the Gas Commission, there is no room for entertaining such a belief. By next year, if all goes well, the gas supply should be from the new works; and the purification will then be efficient.

A commencement has been made in the use of incandescent gas lighting in the streets of Greenock. At the last meeting of the Police Board, Mr. Mitchell, in moving the minutes of the Gas Committee, said that two months ago the Board approved of the erection of 89 incandescent burners in the main thoroughfares of the burgh. Of this number 50 had been put up; the remainder would be erected as early as possible.

The American pipe question is still being kept to the front. The Works Committee of the Glasgow Corporation Water Department had recently before them tenders for 700 tons of pipes, as follows: Messrs. Wood, of Philadelphia, £3255; Laidlaw and Son, of Glasgow, £3970; D. Y. Stewart and Co., of Glasgow, £4135; M'Farlane, Strong, and Co., of Glasgow, £4136; and R. MacLaren and Son, of Glasgow, £4205. The American pipes were offered in 12 feet lengths; whereas the Committee required 9 feet lengths. The offer of Messrs. Laidlaw, being the next lowest to the American, was accepted. Some question was raised at a meeting of the Corporation as to why the American tender was not accepted; and Mr. Osborne, the Convener of the Water Committee, gave the explanation, straight to the point, that it was not accepted because it did not conform to the specification. The offers work out as follows: Wood, £4 13s. per ton; Laidlaw, £5 13s. 5d.; Stewart, £5 18s.; M'Farlane, £5 18s.; and MacLaren, £6—all overhead.

It is not known to everyone how extensively gas is used for lighthouse work. It has, in fact, its own particular sphere. It is not suitable for isolated situations—such as the Bell Rock or Dhu Heartach, both of which are first-class lighthouses situated on reefs of rocks far at sea. For such, a permanent establishment of keepers and an oil-light is necessary. It is not, anywhere in Scotland, used for lights upon headlands or upon islands—such as Ailsa Craig or the Isle of May. For such as these either oil or electricity is suitable. Where gas is found to be the most advantageous illuminant, is in the providing of fixed lights of lesser magnitude for estuaries and the approaches to ports. The Firth of Clyde is full of them; and in the Firth of Forth there are a number. The lights are mostly placed upon floating buoys, which mark navigable channels. The buoys contain gas sufficient to last for a month, so that, if tempestuous weather comes, they can keep the light going without attention; the practice, however, being to replenish them every week or so, when possible. The light burns night and day. Hitherto the buoys have been circular in shape; but they have been found—being of larger size than buoys which do not carry lights—to be apt to change their position, owing to the force of the current acting upon them. A new form of buoy, of boat shape, is about to be tried; the expectation being that these buoys will swing with the current, and not drift. Four of them are being put down in the upper reaches of the Firth of Forth, where the current is strong, as an experiment.

The Directors of the Clippens Oil Company, in their annual report, announce a debit balance of £14,032. They regret the disastrous result of the year's working, but state that it is entirely due to the action of the Edinburgh and District Water Trust. The action, as has been mentioned more than once in this column, was an application for interdict against

GAS AND WATER COMPANIES' STOCK AND SHARE LIST

Referred to on p. 1393.

Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 14	10½	Alliance & Dublin 10 p. c.	24—25	..	4 4 0
100,000	10	,,	7½	Do. 7 p. c.	16½—17½	..	4 5 8
300,000	100	July 1	5	Australian 5 p. c. Db.	107—109	..	4 11 9
200,000	5	Nov. 11	6½	Bombay, Ltd.	6½—7½	..	4 9 7
40,000	5	,,	6½	Do. New, £4 paid	5—5½	..	4 14 6
380,000	Stk.	Aug. 27	12	Brentford Consolidated	300—305	..	3 18 8
240,000	,,	,,	9	Do. New	227—232	..	3 17 7
50,000	,,	,,	5	Do. 5 p. c. Prf.	145—150	..	3 6 8
159,375	,,	Dec. 15	4	Do. 4 p. c. Db. Stk.	134—138*	..	2 18 0
220,000	Stk.	Sep. 15	11½	Brighton & Hove Orig.	273—278	..	4 2 8
208,820	,,	,,	8½	Do. A. Ord. Stk.	200—205	..	4 2 11
933,500	Stk.	Aug. 27	5	Bristol, 5 p. c. max.	130—135	..	3 14 1
420,000	20	Sep. 30	11½	British	56½—57½	..	3 18 3
50,000	10	Aug. 27	11½	Bromley, Ord. 10 p. c.	25—27	..	4 5 2
71,000	10	,,	8½	Do. 7 p. c.	20—22	..	3 17 3
500,000	10	Oct. 14	6	Buenos Ayres (New) Ltd	9½—10	..	6 0 0
98,122	Stk.	—	4	Do. 4 p. c. Db. Stk.	98—100	..	4 0 0
150,000	20	July 15	8½	Cagliari, Ltd.	30—32	..	5 3 1
100,000	10	Sep. 30	8	Cape Town & Dis., Ltd.	16½—17½	..	4 11 8
50,000	50	Nov. 2	6	Do. 6 p. c. 1st Mort.	59—61	..	4 18 5
550,000	Stk.	Oct 14	13½	Commercial Old Stock	340—345	..	3 18 3
196,483	,,	,,	10½	Do. New do.	255—260	..	4 0 9
196,309	,,	Dec. 15	4½	Do. 4½ p. c. Db. do.	154—157*	..	2 17 4
800,000	Stk.	Dec. 15	12	Continental Union, Ltd.	250—255*	..	4 14 1
200,000	,,	,,	9	Do. 7 p. c. Prf.	213—218*	..	4 2 7
51,600	Stk	Aug. 27	14	Croydon A 10 p. c.	315—320	..	4 7 6
163,400	,,	,,	11	Do. B 7 p. c.	252—257	..	4 5 7
535,000	Stk.	Aug. 12	5½	Crystal Palace Ord. 5 p. c.	138—142	..	3 18 11
60,000	,,	,,	5	Do. 5 p. c. Prf.	140—143	..	3 9 11
486,090	10	July 29	11	European, Ltd.	26—27	..	4 1 6
354,060	10	,,	11	Do. £7 10s. paid	18½—19½	..	4 4 7
5,896,590	Stk.	Aug. 12	12¾	Gaslight & Coke, A, Ord.	314—317	+1	4 0 5
100,000	,,	,,	4	Do. B, 4 p. c max.	118—118	..	3 7 10
665,000	,,	,,	10	Do. C, D, E, 10 p. c. Prf.	317—322	..	3 2 2
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	150—155	..	3 4 6
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	222—227	..	3 6 1
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	204—209	..	3 7 0
464,000	,,	,,	10	Do. J, 10 p. c. Prf.	317—322	..	3 2 2
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	182—187	..	3 4 2
1,061,150	,,	Dec. 15	4	Do. 4 p. c. Db. Stk.	138—141*	..	2 16 9
294,850	,,	,,	4½	Do. 4½ p. c. do.	155—158*	..	2 16 11
908,000	,,	,,	6	Do. 6 p. c. do.	205—210*	..	2 17 1
70,000	10	Oct. 28	8	Hongkong & China, Ltd.	14—15	..	5 6 8
3,800,000	Stk.	Nov. 11	10	Imperial Continental	221—226	+1	4 8 6
376,400	100	Aug. 3	4	Do. 4 p. c. Dbs. Red.	99—102	..	3 18 5
473,600	Stk.	Aug. 12	3½	Do. 3½ p. c. Db. Stk.	104—107	..	3 5 5
75,000	5	Dec. 15	6	Malta & Medn., I td.	5½—6*	..	5 0 0
560,000	100	Oct. 1	5	Met. of Melbourne, 5 p. c. Db.	112—114	..	4 7 8
			4½	4½ p. c. Db.	109—111	+2	4 1 1
250,000	100	,,					
541,920	20	Nov. 11	5	Monte Video, Ltd.	14½—15½	..	6 9 0
150,000	5	Nov. 26	8	Oriental, Ltd.	8—8½	..	4 14 1
135,000	5	,,	8	Do. New, £4 10s. pd.	7—7½	..	4 16 0
15,000	5	,,	8	Do. do. 1879, £1 pd.	1½—2	..	4 0 0
60,000	5	Sep. 30	7	Ottoman, Ltd.	4½—5	..	7 0 0
420,000	100	Nov. 2	6	People's Gas, 1st M. Bd. of Chicago, 2nd do.	104—109	..	5 10 1
500,000	100	Dec. 1	6		103—108	..	5 11 1
250,000	10	Sep. 30	10	San Paulo, Ltd.	16—17	..	5 17 3
135,000	Stk.	—	10	Sheffield A.	250—253	..	3 19 0
209,053	,,	—	10	Do. B.	250—253	..	3 19 0
447,427	,,	—	10	Do. C.	250—253	..	3 19 0
5,475,000	Stk.	Aug. 12	5½	South Metrop., 4 p.c Ord	143—146	..	3 11 11
1,416,667	,,	July 15	3	Do. 3 p. c. Db. Stk.	106—109	..	2 15 0
60,000	Stk.	Sep. 15	12	Tottenham and Edmonton, A.	280—290	..	4 2 9
60,000	,,	,,	9	Edmonton, B.	205—215	..	4 3 9
182,380	10	May 27	8	Tuscan, Ltd.	13½—14½	..	5 10 1
149,900	10	July 1	5	Do. 5 p. c. Dbs. Red.	102—105	..	4 15 3
				WATER COMPANIES.			
746,164	Stk.	June 29	10½	Chelsea, Ord.	337—342	..	3 1 5
150,000	,,	,,	5	Do. 5 p. c. Prf.	177—180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p.c. 1 f. Stk., 1875	157—160	..	2 16 3
175,785	,,	Sep. 30	4½	Do. 4½ p. c. 1 b. Stk.	160—165	..	2 14 6
1,720,560	Stk.	Oct. 14	7½	East London, Ord.	232—236	..	3 8 8
654,740	,,	June 29	4½	Do. 4½ p. c. Db. Stk.	163—166	..	2 14 3
390,000	,,	,,	3	Do. 3 p. c. Db. Stk.	106½—107½	..	2 15 10
700,000	50	Dec. 15	7½	G'd Junct'n, 10 p. c. max.	122—127*	..	2 19 0
295,000	Stk.	,,	4	Do. 4 p. c. Db. Stk.	147—152*	..	2 12 8
708,000	Stk.	Aug. 12	13	Kent	362—367	..	3 10 10
160,000	,,	,,	7	Do. New, 7 p. c. max.	215—220	..	3 3 7
1,043,800	100	June 29	10†	Lambeth, 10 p. c. max.	307—312	..	3 4 1
406,200	100	,,	7½	Do. 7½ p. c. max.	227—232	..	3 4 8
350,000	Stk.	Sep. 30	4	Do. 4 p. c. Db. Stk.	147—150	..	2 13 4
500,000	100	Aug. 12	13	New River, New Shares	450—455	..	2 17 1
1,000,000	Stk.	July 29	4	Do. 4 p. c. Db. Stk.	152—155	..	2 11 7
902,300	Stk.	Dec. 15	6	Southw'k & V'xhall, Ord.	163—166*	+1	3 12 3
126,500	100	,,	6	Do. do. 7½ p. c. max.	153—156*	+2	3 16 11
489,200	Stk.	,,	5	Do. do. 5 p. c. Prf.	175—180*	..	2 15 6
1,019,585	,,	Oct. 14	4	Do. 4 p. c. A Db. Stk.	144—147	..	2 14 7
1,155,066	Stk.	Dec. 15	10	West Middlesex	315—320*	..	3 2 6
200,000	,,	,,	4½	Do. 4½ p. c. Db. Stk.	162—165*	..	2 14 7

* Ex div. † Next dividend will be at this rate.

the Oil Company working out the minerals below the old water-pipe belonging to the Trustees, and the laying of the new pipe in the public road. The word "disastrous" is ominous. It evidently means that, if the Oil Company win in the litigation, they intend to throw the burden of loss on the Water Trust. It is public knowledge that the Oil Company, in consequence of the litigation, have dismissed a very considerable number of their workpeople, and closed down a large portion of their works. I hear of an action for £150,000 as damages being in contemplation by the Oil Company against the Water Trust. Of course, such a sum is extravagant; but if an award should be obtained, it will be a large one. The risk the Trustees are running is undoubtedly a heavy one.

The Edinburgh and District Water Trust, at a meeting in Committee on Monday, considered their course of action in connection with the matters in dispute between them and the Clippens Oil Company. The Committee went carefully into the questions between themselves and the Company. It came out in conversation that the Trustees some time ago offered to purchase sufficient of the minerals belonging to the Clippens Company to protect the more vulnerable parts of the pipes in their passage through the Clippens estate, both on the old line and the new loop line. The Trustees offered a sum of £8000 for a settlement of all questions between themselves and the Company; but this was refused. The Clippens Company demanded £10,000; and as an agreement could not be come to, the negotiations were broken off. The Committee on Monday thought that it might be advisable to reopen negotiations, to ascertain the value of the minerals which might be required for the support of the pipes, apart from the loop-line pipe which the Court of Session has just decided has been illegally laid; and a Sub-Committee were appointed for this purpose. The Committee are empowered to ask a conference with the Clippens Company, with the view of endeavouring to come to an amicable settlement between the Trustees and the Company, and to report. It was also resolved unanimously, on the advice of Counsel in Edinburgh and London, to give notice of an appeal to the House of Lords against the decision of the First Division of the Court of Session ordering the loop line of pipes to be removed. The course which is now followed is, I should say, clearly that which should have been adopted long ago by the Water Trustees.

THE LANCASHIRE COAL TRADE DURING 1897.

The general position of the Lancashire coal trade during the year now closing has been one of fair activity so far as the amount of business put through is concerned; but there have been plentiful supplies, and prices have shown no really appreciable improvement. This has been specially noticeable with regard to the season's contracts for gas coal and locomotive fuel, which, as usual, have been an important factor in determining the prices of the commoner qualities of round coal. When inquiries for these began to come upon the market during April, there was a determination on the part of colliery owners to hold out for some advance on the excessively low figures they were compelled to accept to secure the contracts placed in 1896; and in some cases advances of 3d. to 6d. per ton were quoted on last year's rates. The unsatisfactory outlook in the general branches of trade owing to the disturbed labour position, and the unsettled state of affairs abroad, tended so much to destroy confidence in the future, that it was found practically impossible to establish any material advance on the previous season's rates. With respect to gas coal, it was only in very exceptional cases that any advance over the 1896 prices was obtained upon this year's figures; and at the close of the season, when contracts had been practically settled, it was found that on all the really large transactions colliery owners had been compelled to accept very much the same bases as last year—averaging 6s. to 6s. 6d. at the pit for ordinary Wigan four-feet, and 7s. to 7s. 3d. for good screened Arley gas coal, any trifling advance that had been obtainable being chiefly on comparatively small contracts placed early in the season. For locomotive coal, the 1896 price of 5s. 9d. per ton was accepted as the basis for contracts. In the better qualities of round coal, the usual demand for house-fire consumption has been restricted, both with the opening and the close of the year, by the mildness of the respective winter seasons. The January prices were on the basis of about 10s. 6d. to 11s. for best Wigan Arley, 8s. 6d. to 9s. for Pemberton four-feet and seconds Arley, and 7s. to 7s. 6d. for common house coal at the pit mouth; and these during the summer followed the usual fluctuations—receding about 6d. to 1s. per ton. With September, prices began again to harden; and with the close of the year they have got back to practically the same level as that at which they stood in January, but are scarcely firm at these figures. With regard to other descriptions of fuel for steam, forge, and general manufacturing purposes, though the demand for these was somewhat curtailed during the second half of the year by the protracted engineering dispute, and the unsettled outlook in the cotton trade, business generally has been fairly satisfactory as to quantity; the chief complaint on the part of colliery owners being that they have not been able to establish any real advance upon the low prices ruling during 1896. Steam and forge coal during the year has touched as low as 5s. 9d. to 6s. per ton; and all through the quantities offering in the market have been ample to meet customers' requirements. With the closing month of the year there has been a recovery in prices, which have got back to about 6s. 6d. per ton as the minimum at the pit mouth for inland sales. The position with regard to engine fuel has not shown very great variation during the year. Supplies have, of course, fluctuated according to the demand for round coals; but except that the very inferior sorts of slack during the summer got down to about 2s. 9d. to 3s., the average for the whole of the twelve months has remained pretty much at 3s. to 3s. 6d. per ton for common, 3s. 9d. to 4s. 3d. for medium, and 4s. 6d. up to 5s. for the better qualities at the pit mouth.

Langton Matravers Water Supply.—An inquiry has been held by Mr. F. H. Tullock, one of the Local Government Board Inspectors, into the application of the Langton Matravers District Council for permission to borrow £1000 to sink a well, construct a reservoir, and lay down pipes to supply the parish with water.

RICHMOND & CO., LTD.

Works: STRATFORD, E., and WARRINGTON.

Show-Rooms: 132, QUEEN VICTORIA STREET, E.C. and ACADEMY STREET, WARRINGTON.

The "SUNSHINE"

KETTLE WELL FOR BOILING ON TOP.

NO FLUE NEEDED.

BEST VALUE IN THE TRADE.

No. 545	. . . . .	12s. 6d.
„ 547	. . . . .	15s. 0d.
„ 549	. . . . .	21s. 0d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Northern Coal Trade.—The demand for coal in anticipation of the holidays has been very large, and has given activity to all the collieries in the North; while the frost of the last few days has greatly stimulated the demand for both gas and household coals. Best Northumbrian steam coals are quoted at 8s. 3d. per ton f.o.b.; second-class steam coals, at 7s. 9d.; and steam smalls, at 3s. 3d. Manufacturing coals are quieter. For odd cargoes of gas coals, about 8s. 3d. per ton f.o.b., is a common quotation. Locomotive coals have been freely contracted for over next year; the price being 3d. above the quotation for the current year—that is, from 8s. to 8s. 3d. per ton. Gas coke shows no sign of change in the price; but the output is now very large.

Scotch Coal Trade.—Business is still fairly busy, mostly upon old orders, to close up the year. Sales are therefore small. The prices quoted are: Main, 6s. 9d. per ton f.o.b. Glasgow; ell, 7s. to 7s. 3d.; and splint, 7s. 6d. The shipments for the week amounted to 167,251 tons—an increase upon the preceding week of 15,601 tons, and upon the corresponding week of last year of 20,487 tons. For the year to date, the total shipments have amounted to 7,934,198 tons—an increase over the same period of last year of 461,902 tons.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 23.

Sulphate of Ammonia.—There has again been an active market, with further improvement in values; the closing quotations being £9 to £9 2s. 6d. per ton, delivered f.o.b. at the ports. Consumers have been buying more freely; and a satisfactory amount of direct business has been done at full prices. Makers have met the demand; and there is now very little ready stuff available. In the forward position, London offers at £9 5s. per ton, Beckton terms, January-April delivery. For delivery January-June, f.o.b. Leith, £9 7s. 6d. to £9 10s. per ton is required, ordinary terms; but no business is reported at these prices.

Nitrate of Soda is steady at 7s. 6d. per cwt. for ordinary, and 7s. 7½d. per cwt. for fine, quality on spot.

LONDON, *Dec.* 23.

Tar Products.—This market has prematurely assumed a holiday character, which is likely to last until after the turn of the year. There is practically no business being done in many of the products; and buyers are preferring to wait and see the turn of events. Benzols are extremely sick and neglected; while pitch, which is being largely delivered on old contracts, fails to secure even bids at the low prices now quoted. The reported large sales of anthracene by the Tar Products Sales Committee, has lent some interest to this article; but there is no new business to be reported. Carbolic acid is steady at former rates; and solvent naphtha is also in fair request. Creosote is firm, though buyers have not yet got educated to the higher prices being asked. As an index to the position of the trade, a very large tar contract is stated to have been let at 17s. to 18s.; the buyer having practically no carriage to pay on it.

The average market values may be quoted as follows: Tar, 13s. to 18s. Pitch, 16s., West coast ports; 19s., East coast. Benzols, nominal, 90's, 1s. 4d.; 50's, 1s. 6d. Toluol, 1s. 10d. Solvent naphtha, 1s. 7½d. Crude, 30 per cent. naphtha, 7½d. Creosote, 2½d.; liquid, for burning, 3d. Heavy oils, 42s. 6d. Carbolic acid, 60's, 2s. Naphthalene, 55s.; salts, 30s. Anthracene, "A," 5½d.; "B," 4d. to 4½d.

Sulphate of Ammonia.—The improved value of this article is maintained. There is a remarkable absence of stocks in makers' hands, and a capital inquiry for the spring months' delivery. Sellers are asking the following prices: Beckton, £9 5s., January-April; Beckton terms, £8 17s. 6d.; London, £9; Hull, £9 to £9 2s. 6d.; Leith, £9 1s. 3d. to £9 2s. 6d.; Liverpool, £9; Glasgow, £9 1s. 3d.—less 3½ per cent., f.o.b., bags inclusive.

Sales of Shares.—Last Tuesday, Mr. I. J. Robinson sold, at Darlington, 42 ordinary £25 shares in the Weardale and Shildon District Water Company at £40 each, and 43 new £5 shares in the Consett Water Company, at £9 5s. each. A parcel of £40 of consolidated stock of the Trowbridge Water Company lately changed hands at £53.

The Legitimate (?) Action of Trade Unionism.—Referring to the complaint made by Messrs. Danks and Co., of Nottingham, of the action of certain plumbers with regard to a gas-fitting contract, to which allusion was made in the "JOURNAL" last week, the "Ironmonger," to which, it may be remembered, the complaint was originally addressed, says: "It is not alleged, so far as we can see, that Danks and Co. were paying, or intending to pay, their men lower rates of wages than those which are current in the district for the same class of work, but simply that, as they are not plumbers pure and simple, they must not do gas-fitting. This contention is one which cannot for a moment be admitted; and the trade, as a whole, must not, and cannot, submit to the arrogant dictation of the plumbers and their Trade Union. Gas-fitting is, in every sense, work which pertains to ironmongers, and has been done by ironmongers all over the country for any number of years. No other tradesman, in fact, is so well adapted for doing the work as the ironmonger, who not only does the piping, but also supplies and puts up the fittings; whereas the plumber may do the work of laying in the piping, but is rarely asked to supply the chandeliers, brackets, &c., and if he does so it is an outside matter not within his ordinary course of business. As we have said already, this dictation must not be submitted to by our trade; and a vigorous protest must be made against it. Such arrogance as that of which the Nottingham plumbers have been guilty is the sort of thing which makes the methods of the Trade Unions so heartily disliked, and has led to the stern and unyielding fight which is now being carried on by the employers in the engineering trade. We hope the trade will take practical steps to render their protest effectual; and we trust that Danks and Co. will have the support of their employers in the contest which has so suddenly arisen."

JOSEPH AIRD

GREAT-BRIDGE,

STAFFORDSHIRE.

HIGHEST QUALITY

TUBES AND FITTINGS

GAS, STEAM, WATER, GALVANIZED TUBES and FITTINGS in all Sizes.

LARGE TUBES FOR COLLIERIES.

Illustrated Price Lists on Application.

LONDON OFFICES: 46, QUEEN VICTORIA STREET, E.C.

Terrible Results of an Explosion at a Hull Tar Distillery.—Last Tuesday, a shocking explosion took place at the tar distillery of Messrs. Major and Co., of Hull, resulting in the loss of five lives. The bursting of a still set fire to, and caused the collapse of, the surrounding shedding, which fell on a number of workmen, who had no time to escape. Mr. J. R. Woods (Manager) and three of the men—J. W. Tong, Aaron Galtress, and Ward—were killed; the bodies being recovered by the firemen in an almost unrecognizable condition. Another man, named Barridge Pearson, was so shockingly burnt that he succumbed at the hospital during the evening, bringing the number of deaths up to five. The fire brigade was called to the scene; and it was some hours before the burning tar and buildings could be extinguished.

Gas Workers and their Demands.—The "Leeds Mercury" has opened its columns to correspondence on the above subject; the initiative in the matter having been taken by a "Gas Manager." He begins by remarking that the engineering trouble is a grave one; and in his opinion, if any permanent settlement is arrived at, it must of necessity be in the direction of co-operation. But while this question is agitating the mind of the country, he points to another industry which, he says, "contains all the elements of unrest and dissatisfaction with its conditions of labour." He refers to the gas workers of the kingdom, who, he asserts, are almost universally in a state of discontent, and who represent in their present frame of mind a "seething cauldron." The causes, he considers, are simple, and capable of easy settlement if only tackled by gas companies and local authorities in time, and in a reasonable manner. He says: "The complaints, or rather demands, resolve themselves as follows: (1) The desire for the total cessation of gas making on Sundays. (2) Uniformity of payment, as far as possible, in most gas-works. (3) A share in the profits, depending, as in the case of the South Metropolitan Gas Company, upon a sliding-scale, and on the mutual energies of employer and employed. (4) A voice in the management of the concern, representing the savings and bonuses of the employees invested therein. I respectfully submit that these requests are both sensible and moderate, and if granted would lead immediately to a real and final settlement of the disputes which are so frequent and so regrettable in the gas-works of the country. The reasons why gas stokers are asked to work on Sunday are chiefly the consequence of insufficient plant, the damage done to the works by letting down and re-starting, and the extra trouble and anxiety which this must of necessity cause gas managers. But for this no undertaking would, I am sure, object to pay extra remuneration. With regard to the second cause of annoyance, it is a general and well-known fact that it exists. Many concerns even yet are working their men 84 hours per week, and in some cases the hands are required to take out the hot coke into the yard, after drawing each retort. This is work that soon makes a young man into an old one—in fact, I have seen old men at forty through this very thing."

Water Supply and Epidemics.—As bearing on the subject dealt with in the Local Government Board circular-letter (p. 1407) it may be of interest to reproduce from the "Lancet" some extracts from the report of a discussion which took place a short time ago at a meeting of the Royal Medical Society. The subject was introduced by Dr. Vivian Poore, who stated that the contagion of enteric fever is contained in the excreta, and may gain access to the bodies of the healthy in drink or food or air. When enteric fever becomes epidemic, it is most often through contamination of the drinking water, and sometimes through the water of the milk and other beverages. Short records were given of 46 instances within the last thirty years of contamination of public water supplies; and in 29 instances where the figures were given the number of cases amounts to 16,486. These public water supplies were contaminated at the source, in their course, or at the periphery. Of the contaminated sources, eight were streams and rivers, eleven were wells, and three were upland gathering-grounds. Of the polluted wells, seven were deep wells in the chalk. These chalk wells were polluted, by leakage from a sewer, by accidental defilement of an adit, by the tricklings from the surface of an adjacent sewage farm, by backflow from a river, and by leakages from foul ponds and cesspools. Those sources of water which are farthest removed from dense populations are probably safest. Moorland waters are not free from risks. Some of them act unduly upon lead; and it is interesting that Glasgow between 1881 and 1890 had a mortality from enteric fever slightly higher than the average for England and Wales. Given the fact of contamination, wells and springs are dangerous because there is no escape for the polluting matter except into the supply-pipes. Water from uplands has not undergone any filtration before reaching the reservoirs. In rivers we get the advantage of oxidation and sunlight, and only a small proportion of polluting matter at most is likely to be taken up. With regard to pollution in the course, the most common cause is the in-suction of foul air or liquid by leaking water-pipes during intermissions in the supply. The in-suction is especially apt to occur where there is an intermittent supply, and the fouling of the water-pipes is facilitated by the insanitary practice of laying the sewers and water-pipes side by side inaccessible to observation. Both should be laid in subways so that they could be easily inspected. Pollution at the periphery—*i.e.*, through the taps—is most important. It is liable to occur whenever a tap is left turned on and a vacuum is produced in the supply-pipe by intermission of supply, so that foul gas or liquid, or even solids, are sucked back into the house-pipe or main. This peripheral pollution is well understood, and its frequent occurrence raises a doubt whether the abolition of the house cistern does not endanger the purity of the water flowing in the mains. The maintenance of constant pressure in the pipes, although theoretically desirable, is not always practically attainable. Careless or wilful waste of water, when not supplied by meter, should be punishable by fine. Plumbers who attend to drains and sewers ought not to touch water-pipes and cisterns without a complete washing and change of raiment. Dr. Poore thought a well-tilled humus probably the most perfect protection to a water supply conceivable, as he had set forth at length in his published works. There can be no purity of soil without tillage; and organic filth must be placed upon the humus to increase our food supply, and not beneath it to endanger our water supply. He did not think it at all likely that town populations would hastily abandon their water-closets—in London it seemed impossible; but he considered it was time people were taught that excreta properly used might be a source of health, wealth, and beauty.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

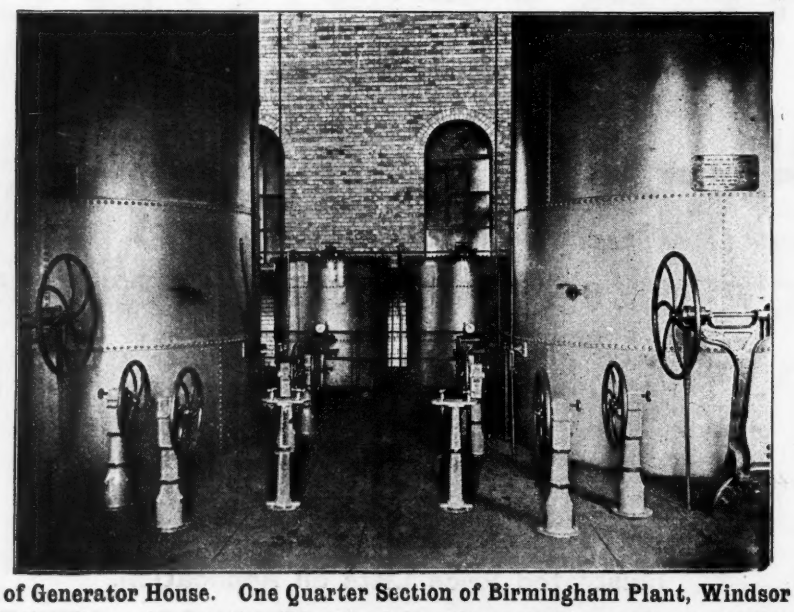
The Economical Gas Apparatus Construction Co., Ld.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

CARBURETTED WATER-GAS ENGINEERS.

THE M.-W.-P. PLANT is designed to use the Heaviest as well as the Lightest Grade of Oil.



RESULTS PROVE EFFICIENCY.

Working Floor of Generator House. One Quarter Section of Birmingham Plant, Windsor Street Station.

The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 10 MILLION CUBIC FEET.

Water Supply in London and New York.—The average daily water supply of London (that is to say, the whole Metropolitan district) was nearly 247,200,000 gallons last September. The population supplied was estimated at 5,730,000, and the number of services was 849,700; making the consumption about 43 gallons per head and 290 gallons per service. New York's consumption averages about 125 gallons per head and 1570 gallons per service. London has 3406 miles of water-pipes, while New York has 750 miles.

Pollution of the Thames.—At the last meeting of the London County Council, the Rivers Committee presented a report in the course of which they stated that a serious case of pollution in the River Wye, a tributary of the Thames, had taken place from a poisonous liquid, described as "cyanide," from the Wycombe Gas-Works, being pumped into the Wycombe sewers, and rapidly passing over the water-logged sewage farm into the Wye, with the result that every fish from Wycombe to the Thames had been killed. The Thames Conservancy Inspector had reported that even the earth worms had been destroyed. Specimens of the dead fish (trout of 4 lbs. each) were produced before the Thames Conservancy Board, who had directed proceedings to be taken. The Committee have instructed the Council's Chemist (Dr. Frank Clowes) and Medical Officer (Dr. Shirley F. Murphy) to attend the proceedings and report as to the result.

The Carlisle Water Scheme and the Outlying Villages.—At the last meeting of the Carlisle Corporation, the Parliamentary Committee reported the steps taken with reference to the Water Bill, the interview of a Sub-Committee with Lord Carlisle and others, and the attendance of the Town Clerk at the Brampton Local Government inquiry as to the application by the Brampton Rural District Council for power to obtain water from the Tarnmonath Spring at Geltsdale, &c. The following resolutions were passed by the Committee: "That as the Corporation are prepared to provide a proper and sufficient supply of water for all reasonable purposes to the villages of Castlecarrock and Hayton, through which the works of the Corporation pass, as also Brampton and Irthington, and are making provision therefor by their Bill, the Local Government Board be requested not to sanction any scheme of water supply from the sources of the Gelt for the use of those places until the application to Parliament by the Corporation has been dealt with." "That the Town Clerk be requested to intimate to the Brampton Rural District Council that the Corporation are prepared to supply them with water for their district from their proposed new works in bulk at any convenient point, and are making provision accordingly in their Bill; and that if the District Council have any proposals to make or suggestions to offer, the Corporation will be glad to receive them, and meet a Sub-Committee to discuss them, with a view of an amicable arrangement being arrived at." "That the Town Clerk be requested to communicate with the Earl of Carlisle, and intimate that the Corporation are prepared to treat for the acquisition of any rights and interests of his Lordship which are required for the purposes of, or may otherwise be interfered with in consequence of, the construction of the proposed new works of water supply." The report was adopted.

Shipley Water Supply.—A Local Government Board inquiry was held last Wednesday at Shipley relative to an application by the District Council for sanction to the borrowing of £2500 for the purposes of the water-works. There was no opposition.

The Gas Workers' Union.—Speaking at a meeting of the North-Eastern branch of the Gas Workers' Union, held last week at Middlesbrough, Mr. W. Thorne, the General Secretary, said he regretted that, despite the great progress made, so many general labourers were yet unorganized. They had in the Gas Workers' Union between 70 and 80 sections of labour; and the Union had been in a position to pay attention to every section, and fulfil every promise made to members on joining. They had been instrumental in securing an eight-hour day in London and most of the large provincial towns. During the last twelve months, 11,602 new members had joined the Union. The present dispute in the engineering trade caused 1100 of their members to be locked-out, costing them £300 a week; and they had paid out to their members £5000. But such was the financial position of the Union, that they could continue to do so as long as the dispute lasted; and they were now taking a vote of the members on the question of granting the engineers £1000.

Fatality at the Manchester (Bradford Road) Gas-Works.—Last Tuesday, an inquest was held at Manchester on the body of Robert Atkinson, a labourer, who met with his death on the previous Saturday at the Bradford Road gas-works. According to the evidence, deceased was employed in emptying a railway waggon, which was standing on a stage. In order to discharge the coal into the retort-house, a trap had to be opened. Half an hour after he was first seen at the waggon, Atkinson was found with his head through the trap, and his feet in the air; his body blocking up the hole. When extricated, it was seen that he was dead. There were four large abrasions on his face, another on the right forearm, and several of his ribs had been fractured. His death was due to suffocation caused by compression of the chest. It was supposed that the deceased, finding that the coal did not run freely through the hole, got up on the waggon in order to assist its movement, and that he overbalanced, and fell into the hole, the coal crushing his life out. A verdict of "Accidental death" was returned.

Among numerous recent gold medals and diplomas awarded to the firm of Messrs. Fletcher, Russell, and Co., Limited, they have had one from Huddersfield, and also from the Third Yorkshire Trades and Industrial Exhibition held at Sheffield, where they again carry off the honours for the best gas cookers and fires.

The value of Stourbridge fire-bricks for blast furnaces has just been demonstrated by an announcement that two of the furnaces of the Hindpool group of the Barrow Steel and Iron Company have been in regular blast for twelve years without requiring re-lining, and are at the present time working very satisfactorily. This is accounted for by the fact that a casing of Stourbridge fire-bricks was employed. At other works, with a less reliable material, the furnaces have had to be re-lined two or three times. The bricks which have done such excellent duty were supplied by Messrs. Harris and Pearson.

R. & A. MAIN, Ltd.

Argyle Works, GLASGOW.
Telegrams: "GASMAIN, GLASGOW."

109, Farringdon Road, LONDON, E.C.
Telegrams: "GASMAIN, LONDON."

BRISTOL: 28, BATH STREET.
Telegraphic Address: "GOTHIC."

BIRMINGHAM: 1, OOZELLS STREET.
Telegraphic Address: "GOTHIC."

MANCHESTER: 37, BLACKFRIARS STREET.
Telegraphic Address: "GOTHIC."

THE
"SALFORD"
Nursery Fire.

No. 581.

16½ in. wide by 6 in. deep by 19 in. high.

For full Particulars see our Lists.

No. 581.

THE
"SALFORD"
Nursery Fire.

No. 581.

Price - £1 7 6

Can be had fitted with Dutch Oven, 2/6 extra.

GWYNNE & BEALE'S

PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095. Holborn.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS;

BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

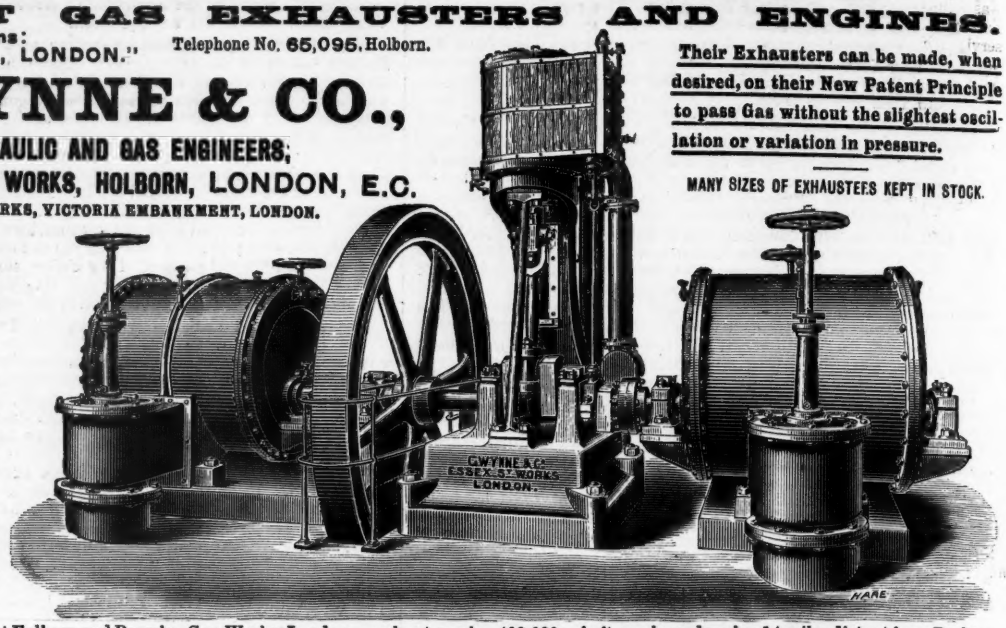
They have completed Exhausters to the extent of 36,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.



Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined: Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.

ANDREW STEPHENSON,
182, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

Telegrams: "Volcanism, London."

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE wanted.

BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E., and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application.

70, CHANCERY LANE, LONDON, W.C.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.

Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, or NEWTON GRANGE, NEWBATTLE, DALKEITH, SCOTLAND.

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

[For Illustrated Advertisement, see Dec. 7, p. 1218.]

TO GAS AND WATER OFFICIALS.

DON'T forget to Order your 1898 Cycle from the MELROSE CYCLE COMPANY, COVENTRY.

TUBES for Gas, Steam, and Water (all Sizes) Welded or Riveted. TANKS, HYDRAULIC MAINS, RETORT-LIDS, &c.

JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

SADLER & CO., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c.

Correspondence invited.

Telegraphic Address: "SADLER, MIDDLESBROUGH."

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.

For all Joints in connection with Oil Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. **Compare Prices and Particulars before ordering elsewhere.**

J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

120 and 121, NEWGATE STREET, LONDON, E.C.

Telegrams: "BOGORE, LONDON."

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.

Before placing Orders, please write for Estimate.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See p. 1322, last week's issue.)

Telegrams: "HUTCHINSON BROS., BARNSLEY."

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.

Please write for Estimate before ordering elsewhere.

IMPORTANT.

OLD Retorts made equal to new by repairing them with CROWTHER'S PATENT STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Can be used in Hot or Cold Retorts; and "A1." for Mouthpiece Joints. Satisfaction Guaranteed.

CROWTHER, Practical Retort Setter, Manor Street, HUDDERSFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.

Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.

READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

WANTED, a competent Working MANAGER, to take charge of a Country Gas-Works on Jan. 13, 1898. Annual Make of Gas, about 4 Millions. Assistance during the Winter Months. Terms 27s. a week, with good House, Gas, and Fuel.

Apply, on or before Monday, Jan. 3, 1898, to Mr. E. J. WHITNEY, Secretary, Gaslight and Coke Company, Limited, Raunds, Nr. Thrapstone, NORTHAMPTONSHIRE.

WANTED, a Stoker in small Works for Day and Night Shifts. Shovel Charging. Wages, 18s., with House, Garden, Gas, and Coal.
Apply, by letter, to No. 2979, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a thoroughly practical WORKING GAS MANAGER for small Gas-Works. Wages £2 per week, with House, Fuel, and Light.
Applications, together with three original Testimonials, to be sent to the CHAIRMAN, Eton Gas Company, 10, High Street, ETON, on or before the 31st of December, 1897.

GAS MANAGER (WORKING).

WANTED, a Sole Manager to take charge of Small Works. One accustomed to Iron Retorts, and able to fix Meters, Service-Pipes, Mains, set Retorts, &c. House, Coal, and Gas found.
Apply to Mr. NEVILE DAY, Easton, near STAMFORD, stating Age, with References, &c.

WORKS MANAGER WANTED.

YOUNG'S Paraffin Light and Mineral Oil Company, Limited, require a MANAGER for their Mineral Oil Works at Addiewell. He must have had a thorough Engineering and Mechanical Training. One who, in addition thereto, has experience in a similar or kindred Industry would be preferred.
Applications, enclosing Certificates (which will be treated in strict confidence), to be addressed to
JOHN FYFE,
Managing-Director.
7, West George Street, Glasgow,
Dec. 22, 1897.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

WANTED Carbon. State Price for 4-ton Lots, delivered at nearest Station.
Address No. 2960, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SULPHURIC Acid for Sale B.O.V. and R.O.V. made from Sulphur. Inquiries solicited.
J. HARDMAN, Chemical Works, Milton and Tunstall, STAFFS.

FOR SALE—300 14-in. Street-Lanterns, with Cradles, in good condition. Reasonable offers will be considered.
Apply to the ENGINEER and MANAGER, Brentford Gas Company, High Street, BRENTFORD.

FOR SALE—A 20,000 cubic feet per hour DEMPSTER'S RECIPROCATING GAS EXHAUSTER, with Connections, complete. In very good condition.
Address No. 2978, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A 6000 Cubic Feet per hour STATION METER, in Cast-Iron Cylindrical Case (8-inch Connections). Equal to new. Made by Messrs. Parkinson and Co. Bye-pass Valves, &c., if required.
Apply to VINCENT HUGHES, Manager, &c., Gas-Works, TIPTON.

GAS-PUMP for Sale, horizontal, one Steam Cylinder, 18-inch bore, and two Gas Cylinders, 17½-inch bore, all 24-inch Stroke, on massive Bed-Plate, with heavy Fly-Wheels. Very strong. First-Class Make. Not much used.
Apply, by letter, to No. 2878, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A Modern Sulphate of AMMONIA STILL, built by Messrs. R. & J. Dempster, Manchester, 1893, with separate Liming Compartment. Capacity, with ordinary Liquor, 5000 to 6000 lbs. of Sulphate per day.
For further Particulars, apply to the BRYMBO STEEL COMPANY, LIMITED, near WREXHAM.

DISUSED Plant for Sale—viz., 500,000 Cubic Feet WALKER'S PATENT PURIFYING MACHINE; Eight PURIFIERS, 12 ft. Square; 250,000 Cubic Feet KIRKHAM, HULETT, and CHANDLER'S WASHER-SCRUBBER; MANN and WALKER'S TOWER SCRUBBER, 5 ft. by 38 ft.
Apply to the GAS-WORKS, HARROGATE.

BARRHEAD GASLIGHT COMPANY, LIMITED.

FOR SALE—Four Purifiers: Two 12 ft. by 6 ft.; one, 11 ft. by 8 ft.; and one 12 ft. by 8 ft., with 8-inch Connections, Valves, and Lifting Apparatus, complete. Very suitable for a small Works.
Can be seen on application to the MANAGER, Gas-Works, BARRHEAD.

THE Oxford Gaslight and Coke Company will have FOR DISPOSAL in 1898 a Set of Four PURIFIERS, 26 ft. by 22 ft. by 5 ft. deep, with Cockey's Centre-Valve and 18-inch Connections and Lifting Apparatus complete. Also a Set of Four PURIFIERS, 20 ft. by 20 ft. by 5 ft. deep, with Six Cockey's Four-Way Valves and 15-inch Connections and Lifting Apparatus complete. One Set will be ready for removal in April, and the other in August next. The IRON ROOFS, with Columns for both Sets, can be purchased if required. They also offer Twelve unusually strong ROOF PRINCIPALS, 50 feet span.
The whole can be seen at the Gas-Works, Oxford.
By order of the Board,
JAMES ELDRIDGE,
Engineer.

ROTHERHAM CORPORATION.
(GAS DEPARTMENT.)

FOR SALE—The following Second-hand GAS PLANT, in good condition:—
Two 30,000 Cubic Feet per hour ROTARY EXHAUSTERS, complete with 12-inch Connections and Bye-Pass.
One 10-Horse Power VERTICAL STEAM-ENGINE.
One 10-inch STATION GOVERNOR.
One 12-inch STATION GOVERNOR.
Three 18-inch RACK AND PINION VALVES.
Seven 12-inch RACK AND PINION VALVES.
Full Particulars and Price from
FRANK A. WINSTANLEY,
Engineer.

FOR DISPOSAL, BY TENDER.

THE Professional Library of the late Mr. F. T. C. Linton, of Leith, consisting of about 160 Volumes, all in condition equal to new.
The Books comprise Volumes of the "Journal," "Engineer," "Engineering," Transactions of various Societies, and Miscellaneous Works on Gas and other Engineering Subjects. A full list can be inspected at the Office of the "JOURNAL."
Tenders for the Books will be received up to Jan. 15, addressed to No. 2977, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO LIME MERCHANTS.

THE Corporation of Birkenhead are pre- pared to receive TENDERS for 1000 Tons or thereabouts of LIME for Gas Purifying, delivered free into their Gas-Works during the ensuing Twelve Months, and as directed by the Gas Engineer, Mr. T. O. Paterson, from whom Forms of Tender and all Particulars may be obtained.
Tenders, sealed and endorsed "Tender for Lime," to be sent in to me not later than Five p.m. on Friday, the 7th of January, 1898.
The Corporation do not bind themselves to accept the lowest or any tender.
By order,
ALFRED GILL,
Town Clerk.
Town Hall, Birkenhead,
Dec. 23, 1897.

TO RETORT AND FIRE-BRICK MANUFACTURERS.

THE Corporation of Birkenhead are pre- pared to receive TENDERS for RETORTS, FIRE-BRICKS, and FIRE-CLAY required at the Gas-Works during the ensuing Twelve Months.
Forms of Tender may be obtained from Mr. T. O. Paterson, Gas Engineer, Gas-Works, Thomas Street.
Tenders, sealed and endorsed "Tender for Retorts, &c.," to be sent in to me not later than Five p.m. on Friday, the 7th of January, 1898.
The Corporation do not bind themselves to accept the lowest or any tender.
By order,
ALFRED GILL,
Town Clerk.
Town Hall, Birkenhead,
Dec. 23, 1897.

TENDERS FOR GAS COAL.

THE Magistracy of Copenhagen are pre- pared to receive TENDERS for the supply and delivery of 110,000 Tons of best GAS COAL during the Year 1898, from April to the end of December.
The Magistracy reserve to themselves the right to divide the Contracts between two or more Contractors.
Further Information and Conditions for the delivery may be obtained on application to the Lighting Department of Copenhagen, Vestre Boulevard, Copenhagen V.
The Tenders (sealed) to be sent to the Magistracy of Copenhagen, Fourth Division, before Jan. 14, 1898, Twelve o'clock, at which time the Tenders will be opened in the presence of the parties tendering who are in attendance.
THE MAGISTRACY OF COPENHAGEN.
Dec. 20, 1897.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to CAPITAL STOCKS, WILL BE CLOSED at Four o'clock p.m., on Tuesday, the 4th day of January next, and will be RE-OPENED immediately after the Half-Yearly General Meeting of the Company, to be held in the Month of February next.
By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.
Chief Office: Horseferry Road,
Westminster, S.W., Dec. 23, 1897.

NEWCASTLE AND GATESHEAD WATER COMPANY.

SALE BY TENDER OF £30,000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.
MINIMUM PRICE: £140 PER CENT.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £30,000 of the NEWCASTLE AND GATESHEAD WATER-WORKS DEBENTURE STOCK, bearing Interest at the rate of Four per Cent. per Annum, to be issued under, and subject to, the Provisions of the Newcastle and Gateshead Water-Works Act, 1890, and the various Acts incorporated therewith, and in pursuance of a Resolution passed at a Special Meeting of Proprietors held on the 29th day of February, 1892.
Particulars and Forms of Tender may be obtained on application to the undersigned; and tenders must be sent in so as to be received at the Offices of the Company not later than Two o'clock on Monday, the 10th of January, 1898.
By order,
GEO. SMITH,
Secretary.
Pilgrim Street,
Newcastle-upon-Tyne, Dec. 14, 1897.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the Directors of the above Company intend to OFFER FOR SALE, by Public Auction at the Mart, Tokenhouse Yard, in the City of London, on Tuesday, the 25th of January, 1898, at Two o'clock in the afternoon precisely, £11,701, being Balance of amount of "C" STOCK issued under the Powers of the Tottenham and Edmonton Gas Act, 1882.
By order,
JAMES RANDALL,
Secretary.
Offices of the Company:
Willoughby Lane, Tottenham,
Dated this 24th day of December, 1897.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Power.
He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.
Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.
Offices: 18, FINSBURY CIRCUS, E.C.

BATTERSEA POLYTECHNIC, London, S.W.

DAY COURSES IN APPLIED CHEMISTRY FOR TECHNICAL STUDENTS.

Head of Chemical Department—W. A. BONE, D.Sc., Ph.D.

Special Day Courses of Instruction in EXPERIMENTAL CHEMISTRY AS APPLIED TO GAS LIGHTING will be given during the ensuing Term, commencing Jan. 10, 1898. The object of these Courses is to impart a thoroughly scientific training in the special branch of Applied Chemistry; and they are specially suited for Youths who are preparing themselves for positions of responsibility in this particular Industry. The Laboratory is open daily. Special Evening Courses for Artisan Students.
A NEW TECHNICAL DAY SCHOOL for Boys preparing for the Building, Mechanical, or Electrical Engineering Trades will be opened Monday, Jan. 10. Fee: £1 per Term.
For Particulars and Prospectuses of other Schools and Classes apply to the SECRETARY.

GAS PURIFICATION BY HYDRATED OXIDE.

THIS Material is of full Strength, and Exceptional Activity. It is specially prepared to minimize Back-Pressure; and will be supplied on Hire, or Sold, on the most favourable Terms.
SPENT OXIDES containing Blue, also CRUDE FERRO-CYANIDE PRODUCTS, either PURCHASED or EXCHANGED for FRESH OXIDE.
MANCHESTER OXIDE COMPANY, LTD.,
CANAL ST., MILES PLATTING, MANCHESTER.

E. ASQUITH & CO.,
Hydraulic Engineers,
17, Mather Street, Ancoats, Manchester,
Fit up Plants for
Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

GAS—NO MORE MANTLES.
BILLING'S NON-MANTLE INCANDESCENT GAS-BURNER. Perfect Light and Cheapness combined. 5s. 6d. Complete; Postage, 6d. extra. Lasts a Lifetime. Can be fixed to any existing Gas-Fittings. Gas-Fitters invited to see it; and Agents required.
Offices, where Samples can be seen (ROOM K),
17, GREAT TITCHFIELD STREET, W.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

THE
"ETNA" FIRE & HEAT RESISTING
CEMENT,

For RETORT PURPOSES, is INVALUABLE.

Sole Manufacturers:
FRED VERITY & SON,
CALL LANE, LEEDS.
Scores of Testimonials received. Write for Particulars.

Telephone: Castleford No. 214. | Postal Address: Castleford.
Telegrams: "Silkstone Castleford."

THE SILKSTONE & HAIGH MOOR COLLIERIES, LTD.

ALLERTON BYWATER, CASTLEFORD.

Steam, Manufacturing, & Gas Coals & Cannel.

Analysis, Contracts, Trial Waggons, and Quotations for Large and Small Orders. Inquiries Solicited.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
80, CANNON STREET, E.C.

HOLMSIDE
GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England, and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE & SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

COKE-BREAKERS,

PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.,
And at STROUD, GLOUCESTERSHIRE.

UNEQUALLED.

Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,

CHESTERFIELD.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to
W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON NEWCASTLE."

BOGHEAD CANNEL
OR
TORBANEHILL MINERAL.

JAMES WOOD, LTD.,

Are the only Producers of the famous original
BOGHEAD CANNEL or TORBANEHILL MINERAL.

F.o.b. or c.i.f. Prices on Application to
28, ROYAL EXCHANGE SQUARE,
GLASGOW.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL Co., LD.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895,*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 „
Ash	2·73 „

For Price, &c., apply to the
WEARDALE IRON & COAL Co., LD.
QUAYSIDE, NEWCASTLE-ON-TYNE.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

BRAY'S

"SPECIAL" & "ADJUSTABLE SPECIAL"

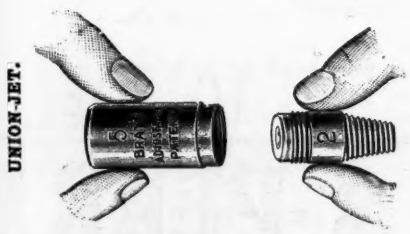
BURNERS.

Suitable for all Pressures and Conditions, are without exception the

GREATEST LIGHT PRODUCERS,

the most Durable, and in the end the

CHEAPEST IN THE WORLD.



Endorsed by the Leading Gas Companies of the World.

SEND FOR CATALOGUE AND PRICE LIST GIVING FURTHER PARTICULARS OF BURNERS MANUFACTURED BY US.

GEO. BRAY & Co.

GAS-LIGHTING ENGINEERS,

Bagby Works, LEEDS.

G. & J. HAIGH,

Raven's Lodge Fire-Brick Works, DEWSBURY.

FIRE-BRICKS of the highest Quality, made from Fire-Clay of a most Superior and Refractory Character, suitable for **GLASS-WORKS, GAS-WORKS, and BLAST-FURNACES.**

WHITE GLAZED AND SALT GLAZED BRICKS, BUFF FACING BRICKS, &c.

For Prices and Analysis, apply as above.

WOMBWELL MAIN COMPANY, LD.,

BARNSLEY.

BEST GAS COAL.

ANALYSIS: 11,390 feet of 17-Candle Gas. Value in Sperm per ton, 686 lbs.
By R. O. PATERSON, C.E.

APPLY

WOMBWELL MAIN COMPANY, LIMITED, BARNSLEY.

Telegrams: "MAIN, WOMBWELL."

LONDON OFFICE
60, QUEEN VICTORIA ST. E.C.

TELEGRAPHIC ADDRESSES
"DRAKESON HALIFAX."
"ECLAIRAGE LONDON."

TELEPHONE No. 43.
"HALIFAX EXCHANGE"

GAS ENGINEERS.
CONTRACTORS.
IRONFOUNDERS.

RETORT SETTERS.
FURNACE BUILDERS.
ETC. ETC.

JONAS DRAKE & SON

SOLE AGENTS FOR
HISLOP'S
PATENT REGENERATIVE FURNACES
— FOR —
ENGLAND, WALES & ABROAD.
RETORT BENCHES ERECTED COMPLETE
WITH OR WITHOUT SPECIAL FURNACES.
RESULTS GUARANTEED.

OVENDEN HALIFAX

Designs and Estimates on Application.

GASEOUS FIRING A SPECIALTY.

MOBBERLEY & PERRY
STOURBRIDGE.

Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

London Agents: Contractors for the erection of Retort-Benches complete.

BALE & HARDY, Gas Engineers and Contractors, BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

W. J. JENKINS & CO., RETFORD.

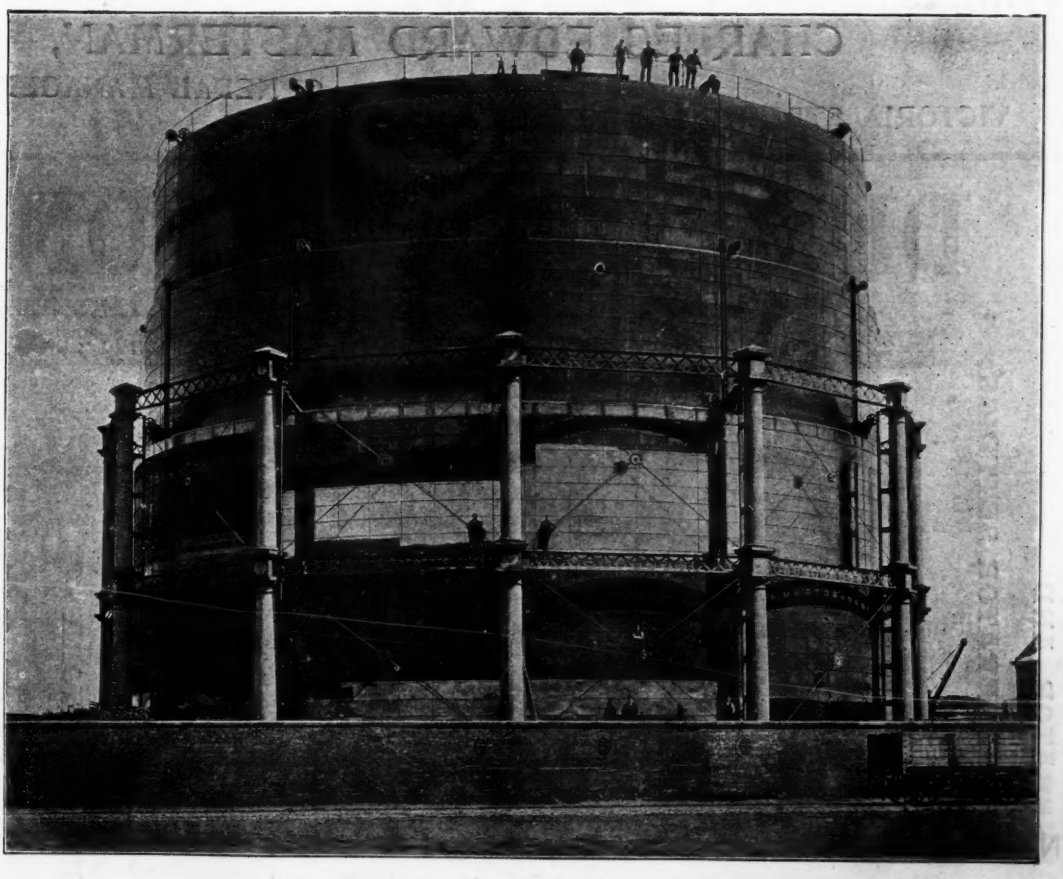
COAL UNLOADING
AND
CONVEYING MACHINERY.

COLUMNLESS GASHOLDERS
ON
PEASE'S STEEL CABLE SYSTEM.

Great Saving in Cost, and Absolutely Reliable in Working.

These Holders are certified by users to be STEADIER UNDER WIND PRESSURE than Holders with Columns.

INSPECTION INVITED. GREAT SAVING IN WEIGHT; FREIGHTS REDUCED.



FOUR-LIFT GASHOLDER, 120 Feet Diameter, 90 Feet High. TWO LIFTS ADDED ON STEEL CABLES (PEASE'S SYSTEM).
(CABLES ON THREE LIFTS)
WALLASEY URBAN DISTRICT COUNCIL.
(From a Photograph.)

Manufacturers and Patentees, Telegrams: "GASHOLDER."

ASHMORE, BENSON, PEASE, & CO., LIMITED,
STOCKTON-ON-TEES.

THE

DENAYROUZE LIGHT SYNDICATE, LTD.,

BEG to announce that, having made arrangements for the Manufacture of their **BURNERS** in England, they are **NOW ABLE TO SUPPLY THESE IN ANY QUANTITY.**

These Burners (with Mantles specially made for the Syndicate by the Incandescent Gas-Light Company, Ltd., under the Welsbach Patents) are admitted by all Experts to be the **BEST AND MOST ECONOMICAL LIGHTS FOR LARGE AREAS AND PUBLIC STREETS.**

Press Notices and Opinions from all the leading Gas Managers throughout the Kingdom can be seen on applying to

CHARLES EDWARD MASTERMAN,
GENERAL MANAGER.

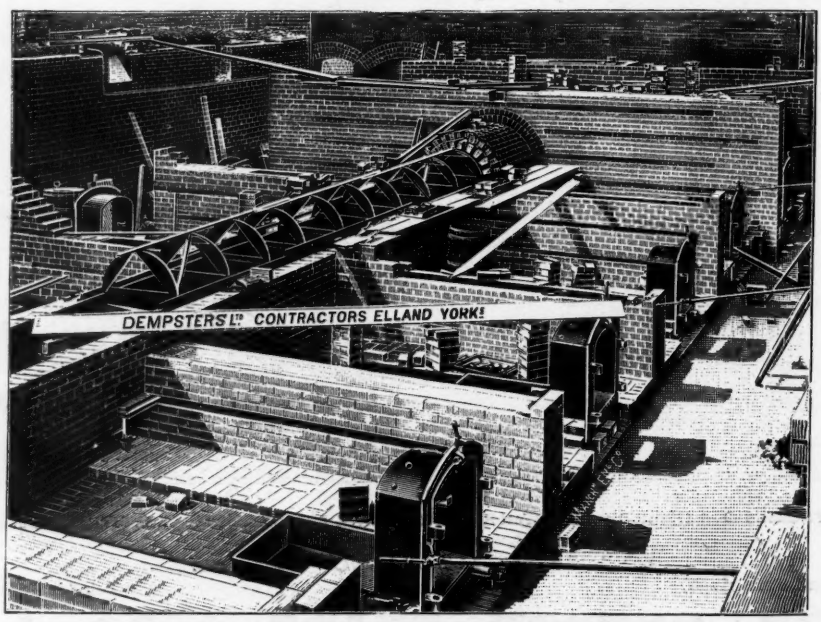
28, VICTORIA STREET, LONDON, S.W.

R. DEMPSTER & SONS,

LIMITED.

ELLAND, YORKS.

DIRECT-FIRED GENERATOR AND REGENERATOR SETTINGS



AND RETORT WORK IN ALL ITS BRANCHES.

REGENERATIVE SETTINGS DURING CONSTRUCTION (From a Photo.).

CONTRACTORS FOR COMPLETE INSTALLATIONS ON HORIZONTAL OR INCLINED SYSTEMS, WITHOUT SUB-CONTRACTING.

S. CUTLER AND SONS, MILLWALL, LONDON.

CARBURETTED WATER-GAS PLANT.

(CUTLER'S PATENTS)

ADOPTED AT HORNSEY, HASTINGS, SOUTHEND,

PLYMOUTH, BUENOS AYRES, SOUTHALL (BRENTFORD GAS COMPANY).

GASHOLDERS

OF EVERY SIZE AND DESCRIPTION.

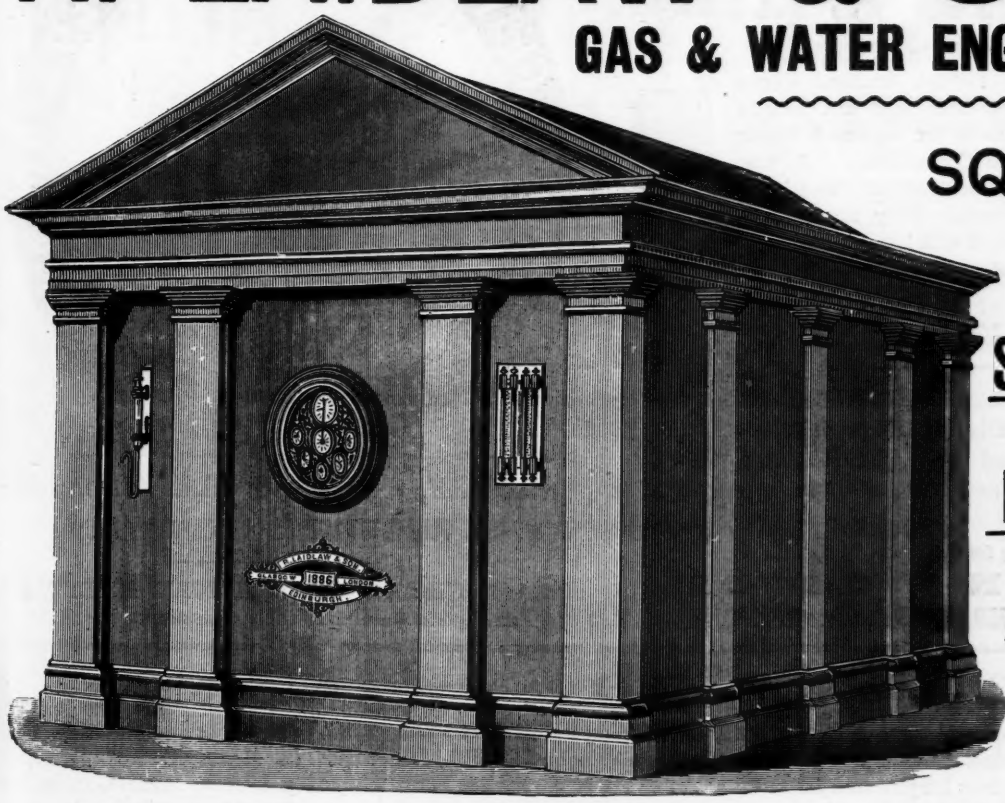
CUTLER'S PATENT GUIDE-FRAMING FOR GASHOLDERS

HAS BEEN ADOPTED FOR MANY IMPORTANT HOLDERS.

IT IS STRONG AND CHEAP, AND REQUIRES NO PIERS FOR ITS SUPPORT.

R. LAIDLAW & SON

GAS & WATER ENGINEERS.



SQUARE

(OR ROUND)

STATION

METERS

ALL SIZES.

SIMON SQUARE WORKS, EDINBURGH. | ALLIANCE FOUNDRY, GLASGOW. | 6, LITTLE BUSH LANE, LONDON.

BOWENS' Ltd. Successors, STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.

Established 1860.

WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

ADDRESS CHIEF OFFICES:

Temple Buildings, 50, New Street, Birmingham.

PETTIGREW'S PATENT

Sulphate of Ammonia Plant

ON THE CONTINUOUS SYSTEM

Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.

Old Systems easily and cheaply converted.

ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.

Makers of Self-Emptying Saturators.

Write for Particulars, Testimonials, and References to

GEO. PETTIGREW & Co.,

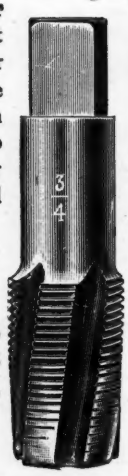
GAS AND CHEMICAL ENGINEERS,

MIDDLESBROUGH-ON-TEES.

PATENT TWISTED TAPER RYMERS & TAPS.

These **Patent Twisted Taper Rymers and Taps** are the best ever made for Gas and Water Service Connections. A true Hole and a correct Thread can be assured. They are easy to work, and will last much longer than straight grooved Taps and Rymers.

THOUSANDS ARE IN DAILY USE.



Also SCREWING-MACHINES, STOCKS and DIES (with Patent Twisted Dies), PIPE-TONGS, and other TOOLS.

Apply for Prices and Particulars to

JOHN RUSCOE,

ALBION WORKS, HYDE, near MANCHESTER.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS,

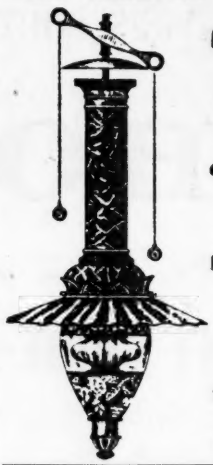
Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

The Climax of Regenerative Gas Lighting!!



THE

"VERTMARCHE"

A 280-Candle Power PLAIN IRON LAMP,

CLASS A— **55/-**

LIGHT for LIGHT

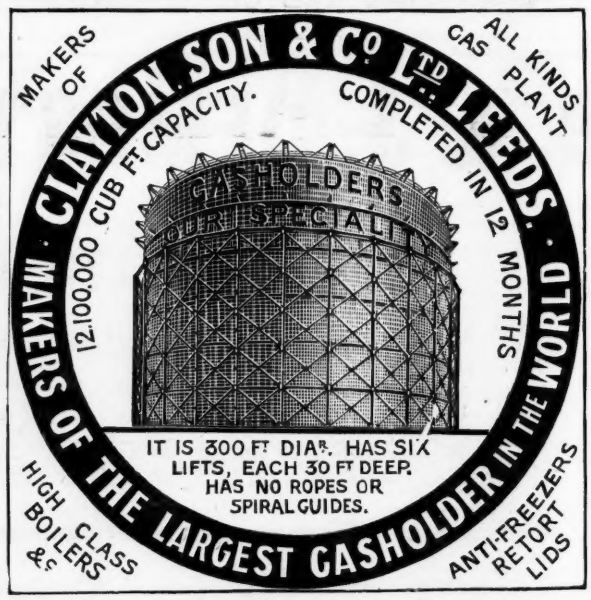
less than half the price of any other Regenerative Lamp.

Manufactured in England.

HENRY GREENE & SONS,

153 & 155, CANNON STREET, LONDON BRIDGE, E.C.

PARTICULARS AND PRICES FREE. AGENTS WANTED.


MAKERS OF
CLAYTON, SON & Co LTD LEEDS.
ALL KINDS GAS PLANT
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
GASHOLDERS
OUR SPECIALITY
IT IS 300 FT DIAR. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD
HIGH CLASS BOILERS &c
ANTI-FREEZERS RETORT LIDS

GIRDERS, ROOFS, & ALL KINDS OF STRUCTURAL IRONWORK.

London Office: 60, QUEEN VICTORIA STREET, E.C.

Telegraphic Addresses: "GAS, LEEDS," "ECLARAGE, LONDON."

H. KIRKHAM & CO.

Are now prepared to Tender for **SCRUBBER-WASHERS** fitted with their Patent Basket or Cage, with Improved Washing Surface. It is acknowledged to be the **MOST EFFECTIVE MACHINE** for extracting Ammonia and other Impurities from Coal Gas. It is guaranteed to Purify 20 per cent. more Gas in the same space, and at considerably less cost per Machine. The Baskets and Scrubbing Surface can be readily applied to all the sizes of the Kirkham, Hulett, and Chandler Machines now in use.

Office: 335, MANSION HOUSE CHAMBERS, LONDON, E.C.

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.
MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1826.

JOSEPH CLIFF & SONS,
INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.
WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.
Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

GODDARD, MASSEY, & WARNER'S
IMPROVED
Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO

GODDARD, MASSEY, & WARNER,
ENGINEERS,
NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

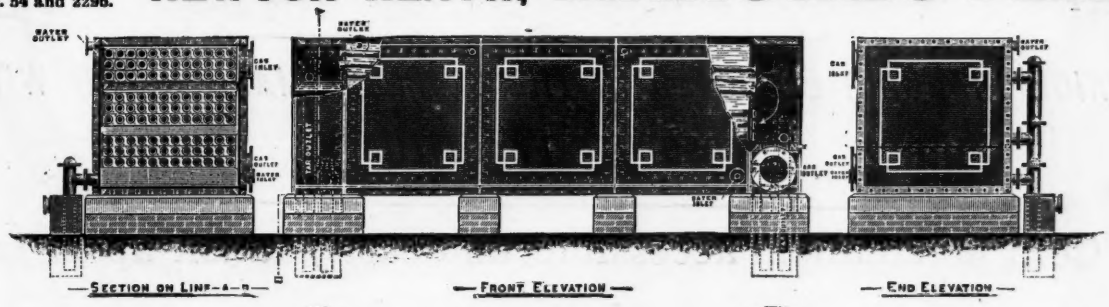
And to the following Gas Companies and Corporations—

ILKESTON.
WIDNES.
HALIFAX.
ALTRINCHAM.
DENTON.
ST. ALBANS.
DUKINFIELD.
NORTHWICH.
HUDDERSFIELD.
BURY.
BRIGHOUSE.
MARKET HARBRO'
PRESCOT.
SOWERBY BRIDGE.
LEICESTER.
DARWEN.
NELSON.
ORMSKIRK.
CHORLEY.
WHITEHAVEN.
CHESTER.
SOUTH SHIELDS.
LEEK.
IPSWICH.
BOURNEMOUTH.
SALFORD.
LUTON.
HAMPTON COURT.

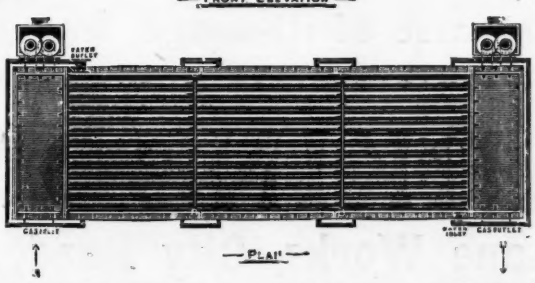
R. & J. DEMPSTER, LTD., GAS PLANT WORKS,

Telegraphic Address:
"SCRUBBER, MANCHESTER."
National Telephone Nos. 54 and 2296.

NEWTON HEATH, MANCHESTER.



IN ACTION.
SLOW-SPEED,
UNIFORM,
EFFECTIVE.



IN DESIGN.
SIMPLE,
DURABLE.
INEXPENSIVE.

WATER-COOLED GAS-CONDENSERS.

R. & J. D., Ltd., have at present in hand, for at Home and the Colonies, Water Condensers equal to **7,250,000** cubic feet per day.

Particulars, Prices, and Testimonials on Application.

PARKINSON'S

PREPAYMENT GAS-METERS.

Many Thousands in use in all parts of the Country.

COMBINE SIMPLICITY WITH STRENGTH.

ACCURACY WITH COMPACTNESS.

Adapted for use with PENNIES, SHILLINGS, or other English or Foreign Coins.

PRICE-CHANGING EFFECTED IN THE SIMPLEST MANNER AND WITH ABSOLUTE EXACTITUDE.

Coin Mechanism accessible, and easily taken apart in case of ill-usage, &c.

W. PARKINSON & Co.

Cottage Lane Works, City Road, LONDON.

Bell Barn Road Works, BIRMINGHAM.

Telegraphic Addresses { "INDEX, LONDON." / "GAS-METERS, BIRMINGHAM." }

Telephone Numbers (National) { London 7778. / Birmingham 1101. }

[See also Advt. p. 1386.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London,—Tuesday, Dec. 28, 1897.